

HORTICULTURAL ABSTRACTS.

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INDEX OF CONTENTS.

HORTICULTURE—MISCELLANEOUS	Nos.	322-326
TREE FRUITS, DECIDUOUS		327-355
Selection	..	..	..	..	..		327-330
Propagation	..	..	..	..	..		331-333
Rootstocks	..	..	..	..	..		334-336
Growth, Nutrition	..	..	..	..	..		337-342
Pollination	..	..	..	..	..		343-345
Manuring	..	..	..	..	..		346-350
Cultural practices	..	..	..	..	..		351-353
Plant protection	..	..	..	..	..		354-355
SMALL FRUITS, VINES, NUTS	..	..	..	..	..		356-361
CITRUS AND SUB-TROPICAL FRUITS	..	..	..	..	..		362-379
TROPICAL CROPS	..	..	..	..	..		380-406
STORAGE	..	..	..	..	..		407-414
PACKING, PROCESSING, FRUIT PRODUCTS	..	..	..	..	..		415-421
NOTES ON BOOKS AND REPORTS	..	..	..	..	..		422-428

Horticultural Abstracts

Vol. I

December, 1931

No. 4

HORTICULTURE—MISCELLANEOUS.

322. **Riabov, I.**

634.1/7 : 581.084.2

A contribution to the methodics of experimental work in fruit growing.

[Russian—English summary.]

R.S.F.S.R. People's Commissariat of Agriculture, Govt. Bot. Gard, Nikita, Yalta, bull. 3, 1930, pp. 78, bibl. 69.

The author explains the basis on which fruit research programmes are being based in the Southern Crimea. As the first essential he demands exact knowledge on climate, soil, altitude, water supply, natural vegetation, and any unfavourable conditions. Next to be considered is the actual type of fruit growing already in being, after which the investigator must consider how best this can be developed in accordance with his data on climate, soil, etc., and what the most urgent problems are for solution. In the Southern Crimea one of the chief factors is water, while variety selection and cultivation methods have also great influence on success or failure. Hence experimental work should be directed on (1) Solution of drought problems, (2) Choice of good varieties and their proper management. A detailed programme is given.

323. **Irwin, J. O.**

634.11:551.56

Precision records on horticulture.

J. Pom. Hort. Sci., 1931, 9: 149-94.

A study based on observations made on apple trees planted in connection with the Ministry of Agriculture's Horticultural-Meteorological scheme, the object of which was to determine the relation between weather and the growth of horticultural crops. Meteorological data were got in stations taking part in the scheme and observations were made from 1925 onwards on apples, plums, black currants and peas. This paper deals only with apples. Part I describes the differences in growth rates, time of starting, absolute amounts of growth, according to location, season, variety and year. It is noted that records would have to be taken for many more years to explain satisfactorily the weather factors responsible for the puzzling interactions with season observed. In Part II the author gives an account of an attempt to overcome difficulties in obtaining precise and valuable information inherent in the original scheme. "For example, an estimate based merely on the inspection of a tree can determine the 50% point of flowering neither accurately nor in a manner comparable between different observers in different places." The author here describes the attempts to apply observations of a precision-record type, such as were employed successfully in the agricultural portion of the scheme, to the flowering of apple trees at East Malling. The paper includes numerous tables and graphs of data obtained.

324. **Johnstone, Katharine H.**

631.878 + 631.53

The use of peat in horticulture.

J. Min. Agr., 1931, **38** : 474-81, bibl. 13.

The uses of peat noted are for propagation—alone or mixed—for potting and for admixture with soils. Thus peat has been successfully added to both heavy and exceptionally light soils for improving soil texture. Investigations would appear desirable into the detrimental effects which have sometimes been recorded after this use of it. Reasons suggested but not definitely proved are acidity and toxicity of peat, while it is possible that insufficient decomposition may cause the withdrawal from the soil of available nitrates by the cellulose decomposing bacteria. This might account for a depressing effect. It is used also for plunging various pot plants, storing fruit, dahlia tubers, and potatoes, for packing tomatoes in a dry state, and potatoes (wet). Practical suggestions are given for preparation of peat before using for propagation purposes. As manure attention is called to its use as a mulch, the possibility of increasing its value by bacterial inoculation, as a substitute for ordinary farm manure after being used as litter. In the last case it is much superior to wood chip manure but possibly inferior to straw manure, owing to potash deficiency and slow decomposition. The chief sources are Great Britain and Ireland, Germany, Holland, Scandinavia, Russia and North America, considerable difference being noted in peat of different origin, formed as it is under different environmental conditions from different plant material.

325. **Kohman, E. F.**

635.64 : 547.313.2

Ethylene treatment of tomatoes.*

Indus. Engin. Chem., 1931, **23** : 1112-3, bibl. 2.

Ethylene and propylene were found to be without effect on the rate of development of red colour on tomatoes, unless they were picked at such an immature stage that they would not have developed red colour for some time, if left on the vine. Such tomatoes would not be suitable for canning because of low yield and poor quality. The report of Harvey† that ethylene treatment brings about ripening on the stem end first could not be confirmed. (Author's summary.)

326. **Harder, R. and others.**

631.588.2 + 631.829

Beobachtungen über das Pflanzenwachstum und die Kohlensäureassimilation bei Kohlensäuredüngung und nächtlicher Zusatzbeleuchtung. (Observations on plant growth and CO₂ assimilation under conditions of CO₂ application and artificial lighting at night.)

Gartenbauwissenschaft, 1931, **5** : 389-428, bibl. 19.

In winter experiments the combination of artificial lighting and additional CO₂, produced from gas coal, forced Madame Moulière hydrangeas into bloom in 37 days, as against 72 days taken by the control plants, and produced better growth generally. Lighting alone had also good effect but to a smaller degree; the addition of CO₂ alone was favourable but only to a very slight extent. Similar results were obtained with other varieties of hydrangeas, cinerarias, campanulas and irises. Fruit formation in strawberries was greatly stimulated by the combination of lighting and CO₂, but not at all by CO₂ alone, and very little by lighting alone. Assimilation pot experiments were made on *Solanum tuberosum*, *Tropaeolum majus*, *Plectranthus fruticosus*, *Phaseolus vulgaris* and *Betula alba*. All 5 plants responded initially to increased CO₂ intensity in the atmosphere with a more or less pronounced rise in assimilation intensity. The experiments demonstrated that a good effect can be expected from CO₂ treatment only when the treated plants are initially normal and healthy.

* See also articles in *Rural Electrification*, 1931, **7** : 108-110.† *Univ. Minnesota Agr. Exp. Sta. bull.* 247, 1918.

TREE FRUITS, DECIDUOUS.

Selection.

327. **Fowler, R.**

634.11(94.2)

Apple culture in South Australia.

J. Dept. Agr. South Australia, 1931, 35 : 18-30.

These notes are primarily for the intending apple grower. Varieties recommended are :— (1) Cleopatra, (2) Jonathan, (3) Dunn's Favourite, (4) Rome Beauty, (5) Granny Smith, and perhaps (6) Delicious or (7) Statesman. Numbers 1, 3 and 5 need fairly dry conditions, 2 and 4 more moisture and cooler conditions. The author notes with reference to rootstocks that, while Northern Spy remains the commonly used stock, considerable possibilities lie in the new immune varieties resulting from crosses made at the John Innes Institution, Merton and at East Malling, England, of Northern Spy with Malling types. [So far some 5% of such crosses have proved immune to woolly aphis.—Ed.] The open centred, rose-shaped tree is generally favoured in South Australia. Notes are given on methods of attaining this shape. Green manuring is recommended. The absence of definite results from experiments conducted with fertilizers is noted, though these may be necessary, especially the nitrogenous ones in case of soil exhaustion. The article concludes with a plea for efficient grading, packing and marketing, instruction on which is provided in the department's bulletins.

328. **Heintz, G. V.**

634.37

Fig culture, fig production and consumption in all countries of the world.
[Russian—English summary.]*R.S.F.S.R. People's Commissariat of Agriculture, Govt. Bot. Gard. Nikita, Yalta, bull. 7, 1930, pp. 69, bibl. 36.*

A summary of world production and consumption. The author describes the different commercial varieties, methods of growing, harvesting, drying, grading and packing in California, Smyrna, Italy, Spain, Algeria, Tunis, Morocco, Portugal, Greece, France, Chile and Australia. He finds that although the fig will readily adapt itself to different climatic conditions, its produce will only be satisfactory under certain combinations of climatic, soil and cultural conditions, which have not as yet been thoroughly investigated.

329. **Burger, I. J. and de Wet, A. F.**

634.37

The culture of the fig tree.

Farming in South Africa, 1931, 6 : 169-70, 187, 207-8, 224, 251-2, 281.

Opens with a discussion of the more important climatic, soil and pruning requirements of the fig tree. The bark and fruits are liable to sunscorch, and the tree itself is also very susceptible to cold. Warm days are needed for the ripening of the fruits, and cool nights are detrimental, since they cause the fruit to become hard and dry and low in sugar. Areas subject to cool nights and heavy dews should be avoided, since such conditions at the time of ripening would be very detrimental. The soil should be deep and fertile with a high percentage of lime. On poorer soils the fig tree is liable to suffer from drought, and frequent irrigation would affect the quality of the fruit adversely. Sandy soils which will retain enough moisture produce good quality figs; fig trees on clay soil produce a fruit that is usually rather coarse. Irrigation will usually be necessary (in South Africa) but must be carefully controlled, or too vigorous trees producing coarse fruit unfit for drying would result. The second part of the article is devoted to the propagation and caprification of the fig. The trees are usually propagated by means of cuttings of well-matured wood 12 inches long, plunged in sandy soil with only the topmost bud above the soil. The wound at the tip of the cutting should be covered with grafting wax, since the cuttings easily dry out. Budding and grafting need extra care, as the wounds of the fig tree do not heal easily. In cleft grafting the cleft should never be made

through the pith in the stem. An interesting and clear account of the caprification of fig trees is given. Part three deals with the picking and drying of figs. Table figs should never be picked till thoroughly ripe. Picking even 24 hours too soon makes much difference to sweetness and weight. The stems must be retained on the fruit for the sake of appearance. The smaller figs should be left on the trees for drying. In some countries the figs for drying are left till they fall from the trees. Some varieties require treatment with sulphur dioxide to improve the appearance. The method is described, and the further processes of drying are dealt with.

330. **Baur, E.** 633/4-1.523

Masters memorial lectures, 1931. I—Evolution. II—Scope and methods of plant-breeding work at the Kaiser Wilhelm Institut für Züchtungsforschung, Müncheberg (Mark), Germany.

J. Roy. Hort. Soc., 1931, **56**: 176-90.

Dr. Baur discusses some of the objections which have been justly raised to the theories of Darwin and Lamarck and which were until recently only capable of disturbing these theories without making any contribution to a clearer knowledge. He gives reasons for holding that *progressively from year to year experimental genetics urge us to accept Darwin's theory of natural selection as being on the whole the true explanation of evolution*. But he considers that the new experiments also show us even more plainly that in every single species of plant or animal the process of evolution *runs on different lines*. It is very probable that perturbations of climate influence and favour mutation and thus produce a bigger and richer material for selection. In his second lecture he gives an account of certain phases of the work at Müncheberg. He shows how the examination of some million and a half lupin plants has enabled them to find the desired alkaloid-free plant, which very shortly should be available for field cultivation on a large scale. Again some 500,000 seedlings of the F₂ generation of *Vitis rupestris* × *V. vinifera* are grown yearly. All these are artificially infected with *Peronospora*. Only the few absolutely immune specimens are then grown under observation for 3 years at Müncheberg. Those showing adequate growth during this period are then propagated by cuttings. Some of these are sent to the Phylloxera Research Institution at Naumburg, near Halle, for examination, while other cuttings of the same individuals are tested out in Western Germany for quality of grape. In 10 years it is hoped to get types possessing excellent qualities in other respects and in addition immunity to *Phylloxera* and *Peronospora*. The expense and trouble are enormous, but at present about one and a half million pounds are expended yearly on spraying, and success would mean the saving of this. He discusses also the breeding work which is being done with definite aims in view of potatoes, tomatoes, *ribes* and *rubus*. As an example of numbers necessary he considers that in a raspberry × blackberry cross really good types will probably only be found in a F₂ generation numbering something like 10,000 individuals. He notes that the discovery has recently been made that certain chemical and physical influences tend to raise the rate of mutation considerably. This offers a possibility of enlarging the material for selection.

Propagation.

331. **Crocker, W. and Barton, Lela V.** 587.34:581.14

After-ripening, germination and storage of certain rosaceous seeds.

Contrib. Boyce Thompson Inst., 1931, **3**: 385-404, bibl. 18.

Notes on varying results following varying treatment of the seeds of named apple and peach varieties, as also of *Pyrus arbutifolia*, *Amelanchier canadensis* and of certain rose species. Among the conclusions reached are the following: The quality of seedling production is considerably affected by the temperature conditions during stratification and germination. Actual

figures are given. Acid granulated peat (pH 4) and neutral peat were equally effective for stratification. Apple seed from pomace showed poorer and slower germination than that from apples. Seeds after-ripened in the apple during cold storage. Peach seeds after-ripened and germinated well in 3½ months at 5° and 10° C., 1° C. being found less favourable. Removal of the pericarp increased the percentage germination. Seeds of Patten Greening, Wealthy and *Pyrus baccata* hybrid apples stored dry for 2½ years germinated almost as well as seeds of the same sort stored similarly for 1½ years, though germination after storing for only ½ year was much higher than either. The effect of varying conditions on seeds of the other plants named above is discussed.

332. **Vogel, F. and Weber, E.** 631.458 : 631.537

Beitrag zur Frage der Bodenmüdigkeit in der Obstbaumschule. (Soil sickness in the fruit tree nursery.)

Gartenbauwissenschaft, 1931, 5 : 508-24, bibl. 9.

A comparison of the soils from two parts of a cherry plantation, both of which were planted up with good, level, cherry seedlings in the spring of 1930, on one of them growth being excellent, on the other very moderate. The only known fact to account for this difference was that the area on which performance was bad had already been planted with cherries from 1906-1910. Previous to this, moreover, it had already carried pears on wild stock, *Rosa canina* seed, ornamental shrubs and shaped apricot trees. After removal of cherries the whole area had been treated alike, being sometimes down to ordinary arable crops, sometimes carrying gooseberries and currants. Lastly it was sown with oats under lucerne. The crop was regular and was harvested dry. All cultivations given were identical. Careful soil analyses gave the following results:—The lower soil and subsoil of the sick part had a significantly larger clay content (particles less than 0.01 mm.) than the healthy. Profile tests showed a higher content of CaCO₃ in the unhealthy part, but owing to its coarseness this could not have much effect. Chemical conditions were not found to vary significantly. Counts of bacterial plate colonies showed these to be 10 times as great from the healthy as from the other soil. Phenomena observed during bacterial examination pointed to differences in bacterial flora. This certainly influenced root activity considerably, but was due to the mechanical physical conditions of the soil and to the different make up of the soil profile.

333. **Manaresi, A. and Lanzoni, D.** 634.25-1.547.5

Influenza del germoglio ascellare sull' allegagione, e della sua cimatura sull' accrescimento dei frutti nel pesco. (The influence of the axillary bud on the set and of its tipping back on the growth of fruit in peach trees.)

L'Italia Agricola, 1931, 68 : 149-52, bibl. 8.

Data obtained from observation of some 722 flower buds at Modena, Nonantola and Bologna, some of which were accompanied by wood buds, some unaccompanied. The probability of fruit formation was about doubled in the presence of the wood buds. Further trials with Amsden and St. Anna showed that increased size of fruit also resulted in the presence of shoots from the wood buds. Moreover where such shoots occurred, tipping them resulted in a 32.9 % increase in size in the case of Amsden and 14.9% increase in that of St. Anna over untipped. The authors note that in the absence of such shoots the fruits are lowest in dry matter, in the presence of untipped shoots the richest, and when the shoots are tipped they have an intermediate position.

Rootstocks.

334. **Upshall, W. H.** 634.11-1.535.6

The propagation of apples by means of root cuttings.

Scientific Agriculture, 1931, 12 : 1-30, bibl. 21.

The reasons for wanting to propagate apples by root cuttings are stated by the author as follows : to get resistance to freezing, which is certainly greater in some variety roots than in average

commercial seedling roots; to get uniformity in behaviour of tree as contrasted with lack of uniformity on miscellaneous seedlings; to obviate resistance to water, nutrient and food transfer offered by a graft union; to perpetuate resistance to diseases and pests, which is not possible with seedlings. Propagation of stem cuttings has not been very successful. Summarizing previous literature on root cutting propagation the author notes that apparently root cuttings and root pieces from older seedling trees usually make a poor stand and those which form new plants grow very slowly, though, in this connection, the rapid growth conditions of California seem to give better results than are got in Eastern North America. He gives a concise account of his field and greenhouse experiments and then describes his analytic work in the laboratory. The following notes are taken from his summary. According to ease of propagation from root cuttings apple roots may be classed as follows: Class 1. Roots of plants grown one season from seed; Class 2. Scion roots of any age and roots of seedlings more than 1 year old. Class 1 produces new shoots and roots and grows rapidly, Class 2 produces a high percentage of plants with shoots but very few with new roots and those surviving grow slowly. Grafting variety stem scions on root pieces of Class 2 does not induce rooting, but grafting root pieces of Class 1 as a "nurse" top on root pieces of Class 2 induces better rooting of the latter. Class 1 roots usually have a slightly higher carbohydrate content. Class 1 roots show higher amylase and catalase activity. There are no consistent differences in respiration rate of root pieces of the two classes. Gum which appears in the vessels of all root pieces and becomes an effective barrier to water passage is apparent soonest and is most abundant in Class 2 root pieces. The greater abundance of wood and pericyclic fibres in the roots of Class 2 is the only consistent difference in anatomical structure noted. Two or three weeks growth in water or sugar solutions followed by transference to a solid medium gives most promise in the rooting and invigoration of the root pieces of Class 2.

335. **Gleisberg, W.**

634.11/13-1.541.11/12

Die Kernobstunterlagenselektion in England. (Rootstock selection for the pome fruits in England.)

Züchter, 1931, 3: 305-21, bibl. 40.

The author, who is not only conducting large scale rootstock experiments in Germany but has personally visited the chief centres of the work in England, reviews the course of apple and pear rootstock investigations in this country from their inception till the present day. Considering the different theories as to the nature and seat of rootstock influence and incidentally discussing the work of the exponents of these different theories, he stresses the immense practical value of the English work on vegetative propagation, of which this article is a most able summary. The illustrations are aptly chosen and include four originals taken by himself.

336. **Matubara, S.**

634.1/2-1.541.1

Experiments on the grafting of fruit trees and their anatomical and physiological observations in relation to its success. [Japanese—English summary.]

Bull. Miyazaki Coll. Agr. and For., No. 3, 1931, pp. 21-42, bibl. 8.

The author's grafting experiments lead him to grade compatibility in fruit trees grown in Japan as follows:—Easy sorts—Japanese pear, Chinese pear, European pear. Intermediate sorts—Apple, Cherry, Plum, Japanese persimmon, Loquat. Hard sorts—Peach, Prunus Mume, Apricot, Chestnut. Positive correlation is found between success in grafting and hardiness of the last season's shoots, which varies between 49.5 and 23.9 according to the kind of fruit tree. The existence of this variation is not proved in varieties of the same kind. It was found that a negative correlation existed between the quantity of tannin present in the cambium of shoots and success in grafting except in the case of the Japanese persimmon. No correlation was found between the degree of thickness of palisade parenchyma of the leaves of different kinds of fruit trees and success in grafting. A positive correlation was found between the number of vessels in the shoots over a definite portion and area and success in grafting. (Notes from author's summary.)

Growth, Nutrition.*

337. **Casella, D.** 634.11/13-1.521

Le forme giovani di alcune specie della Tribù Pomeae. (Young forms of certain species of Pomaceae.)

Ann. R. Ist. Sup. Agr., Portici, ser. 3, 1931, 4: 157-65.

Very good illustrations complete the botanical descriptions of the growth from seed of specimens of the following: *Pyrus communis* var. *Achras* Wild Pear; *P. communis* L., cultivated pear, varieties Mastantuono and Amonaca; *P. Malus* L., apple varieties Limoncella, Annurca and Zitella; *P. Cydonia* L., quince; *P. domestica* L. (= *P. Sorbus*), service tree; *Eriobotrya japonica* Thumb., Loquat; *Crataegus Oxyacantha* L., Hawthorn; *C. Azarolus* L., Azarole. He finds considerable differences exhibited as between the different species, but inside those species merely negligible differences. [In the case of commercial *P. Malus* species a very different story is told by English, Dutch and German investigators of the "Paradise" stocks.—Ed.]

338. **Read, F. M.**

634.11-1.55

Biennial bearing in apples.†

J. Dept. Agr. Victoria (Aust.), 1931, 29: 321-6.

The serious effect of the habit of biennial bearing on the profits of the grower is mentioned. The phenomenon is ascribed to an excess of carbohydrate formation in the non-bearing year when leaves are plentiful resulting in a heavy crop the following year. This restricts the leaf area with the result that only small amounts of carbohydrates are stored and a small crop follows the next season, the cycle continuing indefinitely. The phenomenon is supposed to be initiated by some abnormal occurrence which greatly reduces the crop one year and throws the tree out of a balance which it never regains. Control methods suggested are: (1) Pruning so as to encourage a constant supply of laterals which will fruit on the two-year-old wood; it is considered that if new laterals can be induced to spur up each year there will be more regular fruiting than from spurs on old wood, which, if they fruit one year, rarely bear the next. The laterals should be cut hard prior to the light year so that they will be thrown into growth and will not form flower buds for the succeeding heavy year. In the winter preceding the heavy crop the laterals should be left uncut or cut very lightly, which will result in their growing more moderately and forming flower buds for the ensuing light year. (2) Thinning of fruit or blossoms. This has undoubtedly had an effect, but it is a difficult operation in a large orchard and none of the methods is very satisfactory. (3) The application of nitrogenous fertilizer in the "off year" before the formation of fruit buds (say May in England, November in Australia), so that the formation of the fruit buds for the succeeding year may be depressed. A supply of nitrogen should also be given three weeks before blossoming in the light year, as it is considered that this holds the crop on the trees. In the "on" year no nitrogen need be given. If these measures succeeded and the cropping became balanced, the necessity for varying the treatment would disappear.

339. **Crist, J. W. and Batjer, L. P.**

634.13:576.311.31

The stone cells of pear fruits, especially the Kieffer pear.

Michigan State Coll. Agr. Exp. Sta. tech. bull. 113, 1931, pp. 55, bibl. 48.

The authors give an account of experimental data on the nature of these cells, the time of formation and the effects of the following various factors on stone cell content:—Position of fruits on tree; rootstock; age of tree; vigour of tree; size of fruit; special factors such as epidermal punctures, sealing of blossom end, ringing, defoliation, light intensity; cultural

* See also 326, 353.

† See also 233.

practices ; seasonal influences ; location ; date of picking ; cold storage ; ripening out of storage. The influence of all the above was found to be negative, except where the fruits were punctured and where light was removed by covering the fruits with black cloths. Both of these treatments produced an increased number of stone cells. A consideration of the part played by enzymes suggests investigation of carboxylase and lignase. The stone cell phenomena of the pear fruit appear to be a matter of generic and varietal heredity.

340. Eckerson, Sophia H.

634.11 : 581.192

Seasonal distribution of reducease in the various organs of an apple tree.

Contrib. Boyce Thompson Inst., 1931, **3** : 405-12, bibl. 5.

The reducease activity of a Stark apple tree was tested at weekly intervals over a year. The power of this tree to reduce nitrate was highest in early spring and fell to zero during the five weeks following flowering ; it was low in summer, increasing in late summer and early autumn ; it was high from late autumn to late winter, dropping to very low in February, after which there was a rapid rise to the maximum. Reducease was localized in fall and winter in the fine roots, in early spring in both fine roots and buds. When it occurred in the buds, it was always found at the same time in the adjacent bark. The leaves never contained much.

341. Reinecke, O. S. H.

634.1/2 : 632.1

Die back of fruit trees in the Western Cape Province.

Union of South Africa Dept. Agr. bull. **97**, 1931, pp. 16.

This bulletin sets out as a preliminary measure what is known on this phenomenon as regards South Africa. The cause of the die back is attributed to unseasonable high temperatures in late mid-winter followed by cold weather or drying winds. Trees sheltered on the north side from the sun and therefore under cooler conditions will blossom normally, while similar varieties in exposed situations are badly affected. Since the phenomenon is still incompletely understood, no recommendations other than the admittedly somewhat impracticable one of shelter from the north are made, but experiments in the matter of providing this protection are being undertaken. A useful classification is given, showing for peaches and apples those varieties which (a) always come into leaf normally, (b) those which are slightly abnormal (under the conditions described) and (c) and (d) those which suffer more or less extensively. Unfortunately many of the best known commercial varieties are in class (c) and (d). The degree of susceptibility is affected by altitude : in California the trouble decreases with the elevation, disappearing at 5,000 ft.

342. Quinan, K. B.

634.1/2 : 632.1

How to get our fruit to the European markets in uniformly sound condition.

South African Fruit Grower, 1931, **18** : 131-3.

The unsatisfactory quality of fruits, plums, peaches, etc., as regards flavour, colour and resistance to storage is more marked in some years than in others. The author considers that these imperfections are due to a warm period occurring in some 2 out of 5 winters, which causes internal growth changes in the buds, though the trees remain outwardly dormant. The subsequent cold weather damages these buds, the trees flower later and irregularly and the buds often drop. In uniformly cold winters or in the case of trees which stand in cold but wind-sheltered positions a burst of blossoms occurs early in spring and the trees bear well and normally. A graph illustrating a series of observations on this point shows that trees suffering from delayed foliation in this manner have as much as 50 days less in which to set and mature their fruit than have trees which flower normally. This not unnaturally results in much poor grade fruit. The author considers that a remedy may be found in spraying with oils to furnish a protective coat against untimely evaporation in winter, and in this connection draws attention to Dr. Mally's work on the use of linseed oil on pears in South Africa.

*Pollination.***343. Pashkewitch, W.****634.1/2 : 581.162.3**

The degree of fertility of the fruit trees in dependence on self- and cross-pollination. [Russian—4 p. English summary.]

Bull. Appl. Bot. (Leningrad) Suppl. 49, 1930, pp. 204, bibl. in text.

An account of experiments carried out in the period 1924-1929 at 20 stations in different parts of the U.S.S.R. on apples, pears, cherries, plums, peaches and apricots. The technique was the same throughout. The results are given in tables for each variety as well as for every combination of cross-pollinated trees separately. It is noted that Mrs. Kostina of the Nikitsky Botanical Garden found that different varieties of apple may show 6 different correlations between the length of stamens and the style. The significance of this phenomenon, which is noted, was not further investigated. Parthenocarpy was noted in the Antonovka, the Alexander and Longfield apple varieties. Mrs. Kostina notes a close correlation between ability to set fruits on cross-pollination and the tendency to parthenocarpy. Out of 20 varieties of pear 8 proved self-sterile and 12 self-fertile. Of 50 plums 20 were self-sterile and 30 self-fertile, though here it was observed that some varieties including Jefferson varied in this respect. This may possibly have been due to lack of homogeneity in the trees of this variety. Of 45 sour cherry varieties 8 proved definitely self-sterile, while the self-fertility of the others varied greatly, i.e., being not more than 4% in $\frac{2}{3}$ of the varieties and between 7% and 48% in the remainder. Eight sweet cherry varieties were found self-fertile, in 4 of them fertility ranging only from 0.09% to 5%. The most self-fertile were Yellow Dönissen 44%, Bigarreau Napoleon 57.9% and Black Dayber 64%.

The cross, Ostheimer Weichsel \times Lothkirsche, proved in the same place and the same year inter-sterile in one case, inter-fertile in another. Out of 25 peach varieties only Mme Penaert and Champion proved self-sterile. Five almond and 2 apricot varieties proved self-fertile in varying degree at Salghir. The author pays attention to the parallelism of cyclic sterility and fertility in the results of self- and cross-pollinations and in parthenocarpy. He thinks that a correct opinion as to fertility or sterility can only be got from data taken over a 6 year period (allowing thus for the phenomenon of biennial bearing). Moreover he considers that the tree's age is a material factor, hence parallel experiments are desirable on trees of one variety of different ages. The nutritional conditions must also be standardized. His practice is to pollinate by hand 2 flowers of each inflorescence, removing the rest in due course. He gives instructions for carrying out investigations on the uniform method adopted in the experiments discussed. (From author's summary.)

344. Anon.**634.13 : 581.162.3**

Pollination of pears—the available knowledge.

Orchardist of N. Zealand, 1931, 4 : 8 : 15, 17, and 19.

A résumé of the present knowledge in the light of recent research in England, South Africa, U.S.A. and Sweden. Tables are given showing the degrees of self-fertility noted by different observers, as also of compatible varieties for cross-pollination and of pears with low germinating power. A note is given of the possible influence of rootstocks on the setting of pear varieties.

345. Sachoff, Th.**581.162.3 : 634.22/23**

Untersuchungen über die Fruchtbarkeit der Süßkirschen—Sauerkirschen—Zwetschen—und Pflaumensorten. (Studies of the fertility of sweet and sour cherries, plums and German prunes.)

Gartenbauwissenschaft, 1931, 5 : 574-9.

Experiments at Keustendil in Western Bulgaria. Pollination experiments in 1930 gave the following results. All sweet cherries were found self-sterile. In addition two inter-sterile

groups were found, the first including the early flowering varieties : Keustendil Black Bigarreau, Big Black Bigarreau, Hedelfinger Riesenkirsche = Bradbourne Black (Bunyard), the second the varieties Napoleon and White Spanish Bigarreau, both late flowering. Of the sour cherries only Dienitzer Morello and Halbgaskirsche were found self-fertile, Ostheimer Weichsel and Königin Hortensia being self-sterile. Unsuccessful crossing with the latter was probably due to unhealthy condition of the only tree available. Among plums only Reine Claude was entirely self-sterile. Of German prunes Frühe von Smyrna, and the Keustendiler and Dolaner varieties showed a high degree of self-fertility. Insect pollination is found essential. Honey bees are the most important, while of undomesticated insects the following are found useful :— *Osmia cornuta* and *O. bicornis*, *Bombus pratorum*, *B. mostrucaruss*, *B. terrestris*, *Eristalis*, *Anthophora*, *Andrena*.

*Manuring.**

346. **Antoshin, S. T.**

634.1/7-1.8

Fertilization and crop. Summary of the results obtained from field experiments with fertilizers. [In Russian.] U.S.S.R. Scientific Research Institutes of the Supreme Council of National Economy No. 456. *Transactions of the Scientific Institute on Fertilizers Publ.* 81, 1931, pp. 124, bibl. 368 (112 Russian).

A review of available experimental results in different parts of the world with suggestions for the inauguration of manurial experiments in the U.S.S.R. The author comes to the conclusion that experiments have been so varied and under such variable conditions that results are often not comparable and are applicable only to particular sets of conditions. He notes, however, that generally speaking the effect of nitrogen has been most pronounced, a fact which he considers as explained by the high nitrogen requirement at the time of fruit setting and at the formation of fruit buds in late summer. He notes that nitrogen requirements are found to vary with different systems of cultivation. Response to nitrogen is greatest in citrus, then come peaches and other stone fruits, and last apples and pears. In the case of apples there would appear to be a tendency to incur disease, if excess of nitrogen is added. A fear that nitrogenous manuring stimulates vegetative growth at the expense of fruiting, would not appear well founded. The effectiveness of phosphatic manuring especially in the absence of nitrogenous manuring is not proved, although phosphates are usually given. Except in England, the addition of potash or even the combination PK in the absence of N has been found ineffective. [But see H.A., 348-50 as tending to qualify this statement.—Ed.] It is noted, however, that more significant results on fruit trees have followed the application of P and K under leguminous crops used for green manuring as also of S in the Western States of the U.S.A. This does suggest the possibility that the ineffectiveness of P and K may normally be due to faulty methods of application. The application of lime finds no support in the U.S.A., where limestone is chiefly used, but is strongly advocated in Germany, where caustic lime is used. Green and farmyard manures have proved their worth, but insufficient experimental data are available to justify an opinion as to the merits of other organic manures. Experiments tend to show that the influence of manuring on the quality of the crop has been proved only in colour of fruit, which deteriorates as the result of nitrogenous manuring. The size of fruit increases after nitrogenous manuring. The suspected bad influence of nitrogen and the good influence of potassium on keeping quality are subject to doubt. Insufficient work has yet been done on the influence of manuring on resistance to diseases and pests and on hardiness to warrant definite conclusions on these points. As regards small fruits the lack of results obtained in some American experiments from the addition of manures may perhaps be due to the fact noted by Junge that their root systems are extremely sensitive to excess of plant nutrients. The author considers in turn experimental data on the following:— apples, pears, cherries, plums, peaches, citrus, strawberries, raspberries, currants, gooseberries,

* See also 324.

market garden crops. He considers that investigations on manuring should certainly include S, Mg and Mn, and he strongly urges the initiation of simple fundamental experiments on the different important fruits in the particular areas of the U.S.S.R. in which those fruits flourish. The bulletin concludes with a formidable but useful bibliography.

347. **McKinnon, L. R. and Lilleland, O.** 634.1/2-1.83

A method of application designed to insure proper distribution of fertilizers in field trials with fruit trees.

Soil Science, 1931, **31** : 407-9.

The difficulty of getting potassium down to the roots of fruit trees in certain soils led the authors to make injection experiments. They used a power spray rig, an injection rod made from ordinary pipe fittings being substituted for the spray rod. The rod was $\frac{1}{4}$ " gas pipe, threaded at both ends, the length depending on the depth of injection desired. A hole $\frac{1}{8}$ " in diameter was drilled through a plug, which was screwed into a coupling, and the coupling was screwed on to the $\frac{1}{4}$ " gas pipe. The plug and coupling were then ground down to a point on an emery wheel. On the other end of the rod was fitted a $\frac{1}{4}$ " globe valve, which takes the standard spray hose nipple. A spade handle affords a good grip. It was found possible to use 2 such injection rods with an average power spray rig. The pressure gauge should register at least 200 lbs. with both rods in action, under which conditions no difficulty was found in forcing the rods to the depth required. In the experiment field it was found possible to distribute 50 gallons of solution over 200 sq. ft. at a rate of 1 hole per sq. foot to a depth of 3 ft. in 15 minutes, taking the time of 2 men. An analysis of the amounts of water soluble and replaceable K at different soil levels down to 4 ft. showed the success of the injection method and its great superiority to surface spreading. The possibilities of the method for use in soil deficiency trials are noteworthy.

348. **Boyle, R. A.** 631.83 : 631.84

The case for potash. Its relation to nitrogen.

Fruit World of Australasia, 1931, **32** : 465-6.

In a general account of the uses of potash in horticulture it is stated that experiments in Australia present many contradictions to European practice. This is attributed to climatic differences between the two continents. A further possible reason is a difference in the nitrogen-potash balance of the soil, which renders the application of potash useless without a corresponding raising of the nitrogen content. Long-range experiments would be needed to test the effect of nitrogen-potash balance on crop yield and life of fruit trees, though indication of possibilities might be obtained from experiments on annuals.

349. **Read, F. M.** 634.1/2-2.1

Leaf scorch of fruit trees.

J. Dept. Agr. Victoria (Aust.), 1931, **29** : 386-7.

A brief summary of the information to be derived from Wallace's experiments at Long Ashton and suggestions for its application to Australian conditions. Where leaf scorch is prevalent, 3 or 4 lbs. of sulphate or muriate of potash per tree should be applied in August for 3 or 4 years or until the trouble disappears. Heavy nitrogen manuring should be avoided, and on rich soils high in nitrogen the nitrogen content may be lowered by allowing weeds to grow.

350. **Stägmeyr, E. and Reinecke, V.** 634.13-1.83

Der Einfluss der Kalidüngung auf Farbe, Geschmack und Haltbarkeit der Früchte. (The effect of potash on colour, taste and keeping quality of fruit.)

Ernährung der Pflanze, 1931, **27** : 377-9, bibl. 1.

Notes on the most satisfactory results obtained with William pear trees, mature and in full bearing, at Groot Drakenstein, South Africa, by the addition to the ordinary manuring with

600 lbs. supers. and 250 sulphate of ammonia of 300 lbs. sulphate of potash per acre. The 8 plots were of $\frac{1}{2}$ acre each, 4 being controls. No result was noticeable in the year of treatment, but in the following year the keeping quality of pears from the potash treated plots was tested and found superior. The colour was also favourably affected, especially in the third year, and the fruits were firmer and of better taste.

Cultural Practices.

351. **Kemmer, E.** 634.1/2-1.542.3
Historisch-Kritische Betrachtungen zur Frage der Kronenform der Obstbäume. (A critical and historical consideration of shape of head in fruit trees.)

Gartenbauwissenschaft, 1931, 5: 429-56, bibl. 174.

Up to 1650 in Europe it would appear that fruit trees were allowed to grow more or less as they pleased, the representations of them in contemporary art being almost entirely formal and worthless for determining their exact appearance. Since then every type of shape has been tried and advocated. The author's investigations and observations on the experience of others lead him to consider that no final choice can be made in favour of open centred or pyramid trees, though trial might well be made of the modified leader system. Seventeen illustrations are pleasing and informative.

352. **Manaresi, A. and Benassi, F.** 634.25-1.542.27
Nuove ricerche sul diradamento dei frutti nei peschi di varietà estivo-autunnale. (Peach thinning trials.)
L'Italia Agricola, 1931, 68: 7-12, bibl. 3.

An account of one year's experiments on 5 year old trees of the variety *Buco incavato giallo* and on 7 year trees of *Percocca gialla* or *Gialla di Napoli*. Sixty-four trees were taken of each, 20 of them left unthinned, 32 lightly thinned (10.8% and 11.9% respectively) and 12 were thinned to the extent of 21.4%. Results are tabulated in full.

In *Buco incavato percocca* the natural fall dropped from 40.9—33.3%, the total crop weight from 27.15—22.5 kg. and the average weight of single peaches rose from 127.6—147.4 gr. In *Gialla di Napoli* the corresponding figures were 41.0—31.7%, 51.4—45.9 kg. and 107.1—116.7 gr. The summer was particularly dry and the authors think that the development of the thinned peaches in a normal, wetter year would probably have been so great as to make the treatment economically sound.

353. **Bensemann, E. C.** 634.1/2-1.542
Plant growth of fruit trees.
Orchardist of N. Zealand, 1931, 4: 7: 14; 15 and 17.

The author from practical observations advances the theory that the plant growth of apple trees is developed in a series of groups of 3 buds at a time. By careful selection of these groups, great advantage is to be gained at pruning time, particularly in the formation of new trees. At pruning the cut should be made between these groups of 3 buds counting from the top of the shoot. If it is made in the middle of a group, irregularity of growth will occur, that from the higher buds being greater than that from the lower and the result an irregular tree.

Plant Protection.*

354. **West, E. S.** 632.111
The apparent effect of Mallee scrub in causing frosts.
Fruit World of Australasia, 1931, 32: 573-4.

Investigations into the causes of unusually severe frosts occurring in certain localities on the Murrumbidgee irrigation areas, New South Wales, led to the suggestion that the dense Mallee

* See also 341, 342.

scrub near these localities might be in some way responsible. A line of thermometers was placed from $\frac{2}{3}$ of a mile within the scrub to about $3\frac{1}{4}$ miles outside. The mean minimum readings after seven calm clear nights showed the minimum temperatures outside the scrub to be six degrees higher than those within it. The stations furthest from the Mallee showed the highest minimum temperatures. Other data obtained indicate that this difference is due to the Mallee vegetation itself and not to soil type.

355. **Johnstone, Katharine H.** **634.11-2.42**

Observations on the varietal resistance of the apple to scab (*Venturia inaequalis* Aderh.) with special reference to its physiological aspects.
J. Pom. Hort. Sci., 1931, 9 : 30-52, bibl. 16 and 195-227, bibl. 24.

The author's studies, while not enabling the exact cause of resistance or susceptibility to be determined, allow her to draw the general conclusion that the ultimate character distinguishing a resistant from a susceptible variety is associated with the nature of the fluids bathing the epidermal cell walls, which form the environment of the parasite. In a susceptible variety the fungus is able to establish itself beneath the cuticle since the environment is congenial, whereas in a resistant variety it is uncongenial.

SMALL FRUITS, VINES AND NUTS.*

356. **Triquart, J.** **634.711-1.521**

Ertragssteigerung durch Auslesezücht bei Himbeeren. (Increased raspberry cropping as the result of selection.)
Obst- u. Gemüsebau, 1931, 77 : 141, bibl. 1.

The writer, who had previously achieved considerably increased strawberry crops by selection, has applied the same method with equal success to raspberries. He found considerable confusion in nomenclature of specimens from various nurseries. Very careful roguing, however, enabled him to show large differences in cropping of the following varieties :—Preussen, Lloyd George, Marlborough, Fastolf, Goliath, Knevets Riesen, Harzjuivel, Superlative. The separation out of these pure vegetative lines resulted in crops three times as great as those previously obtained, the first three having the heaviest crops in the order given.

357. **Darrow, G. M.** **634.713(79)**

European blackberry seedlings and hybrids in the Pacific North-west.
J. Hered., 1931, 22 : 143-6.

An account of the spread in Western Oregon and Washington by birds and other agencies of the Evergreen (=Cut leaved or American cut-leaf) and the Himalaya blackberry. They are becoming a menace as weeds. Some thirty collections of forms of hybrids or of seedlings of these two varieties were made at the Oregon State College, Corvallis, where they are under examination regarding their fruiting habits and desirability for further propagation.

358. **Hanson, H. C.** **634.75 : 581.144**

Comparison of root and top development in varieties of strawberry.
Amer. J. Bot., 1931, 18 : 658-73, bibl. 2.

Comparative studies of 18 varieties of strawberry grown under irrigation at the Colorado Agricultural Experiment Station at Fort Collins. The soil, which was a heavy clay loam, and the cultural methods used are described. The trench method of excavation was adopted. Maps are given in many cases and a description of root and shoot growth in the case of all

* See also 425.

varieties. Notes are made on the different vegetative characters found. Considerable relationship was found between top and root growth. Varieties with very good to excellent development of both top and root systems were Marvel, the everbearing varieties, Champion, Duluth, Mastodon, and Progressive. Those with poor to fair development of both tops and roots were Aroma, Boquet, Eaton, Gibson, Howard 17, Minnehaha, Nokomis, Pearl and Pride of Denver. In Belt the root system was poor, the tops fairly good. In Chaska the root system was excellent and the tops fair; in Oelrich the root system was fair, the tops poor.

359. **Paponof, N. V.** 634.8-1.521
Materials for breeding grapes on the Southern coast of the Crimea. [Russian
—English summary.]

J. Govt. Bot. Garden, Nikita, Yalta, 1931, 16: 1: 1-51, bibl. 28.

An account of viticultural breeding work done by the Nikitsky Experimental Botanical Garden since 1927. The chief varieties grown on the state farms are: Cabernet, Sauvignon, Semillon, Kakour blanc, Sapéravi, Furmint, Muscat blanc, Riesling and Aligoté. Investigation shows the stands of these and other varieties to be very mixed and several different types have already been segregated. Varieties of the same hermaphroditic flower type show a different percentage of setting according to the variety. Positive correlations have been established between productivity and the following other characteristics: leafiness of the vine, length of shoots, general acidity of the must, number of shoots, length of pruning; while negative correlations have been found to exist between productivity and general sugar contents of the must, general sugar contents and general acidity of the must, and compactness of cluster and length of pruning.

360. **Trotter, A.** 634.54:581.46/47
Botanica del nocciuolo nei suoi rapporti con la tecnica culturale. (Botanical features of the hazel as affecting its cultural treatment.)
Ann. R. Ist. Sup. Agr. Portici, ser. 3, 1931, 4: 226-40, bibl. 10.

A discussion on the reproductive apparatus of *Corylus Avellana* and its possible connection with the phenomenon of empty nuts and of nuts which, although having a normal appearance and showing no sign of perforation, are found to have deteriorated inside. The second phenomenon is in the author's opinion probably due to the action of plant bugs,* the first either to an inherited racial characteristic or more probably to faulty nutritional conditions.

361. **Romeo, A.** 6345.4-2.1
Ricerche sull' "Aborto" del nocciuolo. (Abortion in hazel nuts.)
Ann. R. Ist. Sup. Agr. Portici, ser. 3, 1931, 4: 221-5, bibl. 6.

The author finds that abortion may be due to physiological reasons or to wounding. The wounding is done by puncturing and abstraction of juice by plant bugs when the seed has not yet developed. The result differs according to the development of the nut at the time of perforation.

CITRUS AND SUB-TROPICAL FRUITS.

362. **Braverman, J. S.** 634.3(45)
Citrus growing and by-products industry in Italy.
Hadar, 1931, 4: 170-2.

A general description of the citrus industry in Italy. A point of interest is the method of producing Verdelli or summer lemons to mature at a time when the old crop is exhausted. The lemon tree is allowed to blossom as usual in spring. In July and August, as soon as the fruit is set, the roots are uncovered, causing the tree to wilt and part of the young fruit to drop.

* Boselli has now concluded his work on the biology of these Hemiptera-Heteroptera at Ucria in Sicily.—ED.

When a sufficient degree of wilting has been obtained, the roots are re-covered and the tree heavily manured. The tree puts forth a new crop of shoots and blossoms and these become pickable in the following summer. The authorities at the Research Station of Acireale are stated to believe that this practice does no harm to the tree, provided it is carefully cultivated. Many orchards have been using this method for years and the trees are still in perfect condition.

363. Hodgson, R. W.

634.3(569 and 794)

Comparisons and contrasts in citriculture between Palestine and California.

Hadar, 1931, 4: 186-91.

A lecture given to the Citrus Growers' Section of the Jewish Farmers' Federation of Palestine by Professor Hodgson of California. The lecturer covered all the problems of citrus culture very thoroughly. A point he particularly emphasized was the necessity for a suitable stock. He thinks that the sweet lime in general use as a stock in Palestine (unknown in California), is not long lived, is specially subject to trunk and root diseases and that its high initial vigour, growth rate and early production is one of the causes of the difficulties in training young trees to form a strong and durable system of framework branches. The sour stock which is much less used in Palestine would appear to be more suitable. He considers that the Palestine groves are over irrigated. In California over irrigation has caused more loss than any other factor. It has been proved that the best results are obtained by letting the soil dry out to near wilting point and then applying moderate irrigation; this encourages deep rooting as the roots penetrate downwards in search of water. The application of phosphorus, potassium, limestone, or peat is regarded in California as waste of money. There is no way of bringing about the necessary deep penetration of phosphorus and potassium when applied in chemical form. Decomposable organic manure and nitrogen are the only substances to which, in California, citrus trees give an economic response. Cover cropping is regarded as the best and cheapest way of improving the soil in young groves. Over tillage is wasteful, though some tillage is necessary to keep down weeds, incorporate manures into the soil and provide loose earth for irrigation furrows. Two of the commonly believed values of tillage have of recent years been found to be erroneous, namely that it conserves soil moisture and that it aerates the soil. Californian experience shows that water penetrates equally well when the surface soil is crusted or cracked and that it is unnecessary to cultivate the soil after every irrigation. Pruning is a practice commonly overdone. Its most important functions are to regulate light conditions and hence the distribution of fruit bearing wood, and to facilitate necessary orchard operations, and to protect the fruit from scratches caused by dead wood. Most of the pruning in Palestine has been due to the removal of dead wood caused by the crowding of trees and the shading which results. Properly spaced and cultivated trees require very little pruning.

364. Carrante, V.

634.33: 575.2

Aspetti genetici e standardizzazione della produzione dei limoni. (Genetics and the standardization of lemon production.)

L'Italia Agricola, 1931, 68: 393-8.

A note on the standardization of the Eureka and Lisbon lemons in California. Propagation of both these by budding with material from the most strongly growing trees led to the prevalence of vast numbers of poor strains of both these varieties which were much mixed. Efforts have since been made with considerable success to regraft with wood possessing the desired qualities. Notes are given on the yield, chemical composition and other features of both varieties, and it is found that, although their actual production of acid and of oil is not very different, the times at which these products become available in the two varieties differ considerably. No important correlations are found to exist between specific weight, acid yield and oil yield of the two varieties, but it may be noted that varieties which mature chiefly in winter have a low acid content in January-June and a high one for the rest of the year. In summer bearing varieties the contrary holds good. The author concludes with a plea for a standardization of suitable varieties in Sicily, which can only be chosen after investigation of their merits from every possible point of view.

365. **Casella, D.** 634.3-1.521

Le forme giovani delle principali specie del genere Citrus. (Young forms of the chief species of the genus Citrus.)

Ann. R. Ist. Sup. Agr. Portici, ser. 3, 1931, 4: 166-75.

The species and varieties examined are:—*Citrus Limonum* Risso; *C. Limonum amalphantanum* Ferr.; *C. Aurantium* L.; *C. vulgaris* or Bigaradia Risso; *C. sinensis* Pers.; *C. Bergamia* Risso; *C. nobilis* Lour.; *C. medica* Risso var. *liscia*; ditto var. *riccia*; *C. decumana* L.; *C. Limetta* Risso; *C. Mellarosa* Hort. After describing the phenomenon of polyembryony he proceeds to a careful description of the seeds of average specimens. An account is given of the process of germination and following this of the particular forms taken by the different types. He differentiates between the cotyledons, shape and other characteristics of growth in leaves and stem. Seventeen plates add considerably to the value of the article.

366. **Rolfs, P. H. and Rolfs, C.** 634.3

Propagacion de frutas citricas en el Brasil. (Propagation of citrus fruits in Brazil.)

Boletín de la Union Panamericana, serie sobre agricultura 72, 73, 74, 1931, pp. 65.

The bulletin is divided into three parts, of which the first deals with general principles such as the need for healthy orchards, the importance of using only the best material, growing only those varieties for which a demand is assured and so on. A detailed description of the principal types suitable for use as stocks is given with photographic illustrations of fruit, leaf and seed. Part two deals with nursery practices, selection of and sowing the seed for the rootstocks, budding, the building up of the plant and general cultivation. The use of the hoe is strongly deprecated. Horse drawn cultivators are advocated. They can weed up to within 5 centimetres of the plant rows on each side, leaving only 10 centimetres from which the weeds must be pulled by hand. In selecting stocks for budding it is emphasized that only those in good condition should be used. All unthrifty ones should be rigorously eliminated. The third part is concerned with methods of lifting, packing and transport to the permanent site and with the final planting. In short the bulletin forms a very complete guide to those modern cultural practices which are most suited to local conditions.

367. **Rolfs, P. H. and Rolfs, C.** 634.3

A muda de citrus. Pedra angular da industria citricola. (The citrus plant. The keystone of the citrus industry.) Secretaria da Agricultura Estado de Minas Geraes, Brazil, 1931, pp. 126.

Contains in Portuguese similar information to that given in No. 366 by the same authors in Spanish, but is written with special application to the State of Minas Geraes.

368. **Hunter, R. E.** 634.3-1.535.4

Citrus propagation. The propagation of citrus by means of the solar propagator.

Trop. Agriculture, 1931, 8: 90-93, bibl. 10.

Alludes to the importance of vegetative propagation of rootstocks. The difficulty in citrus lies in the fact that it is not easy to get certain varieties suitable for stocks to root from cuttings. In the solar propagator bottom heat is obtained by trapping the sun's rays in a heating chamber which is continuous with the underneath of the propagating bed, and the hot air impinging on the under surface of the bed supplies the bottom heat. A full description and diagram is given. The apparatus is on the lines of that described by Swingle (*United States Dept. Agr., circ. 310, 1924*), but there are a number of improvements. The sour orange has rooted in about 50 days in the solar propagator. Limes root very easily and quickly in it.

369. **Haas, A. R. C. and Klotz, L. J.** 634.3 : 546.27

Further evidence on the necessity of boron for health in citrus.

Bot. Gaz., 1931, 92 : 94-100, bibl. 3.

Two quart Mason jars were used for the water cultures, in which were grown 7 sour orange (*C. Aurantium* Linn.), 13 rough lemon (var. of *C. Limonia* Osbeck), 2 Spanish bitter orange (var. of *C. Aurantium* Linn.) and 7 Lisbon lemon (var. of *C. Limonia* Osbeck) 3 leaf-cuttings, as well as various named cutting combinations of scion and rootstock. The authors note the necessity of using for several years previously any glass, enamelled jars or earthenware in which boron deficiency experiments are to be done. As in sand cultures previously described* carbohydrates were much greater in boron deficient leaves than when it was present. The authors describe their method of determining the relative diastatic activity of mature leaves of boron-deficient and boron-supplied cultures. The leaves from the former cultures showed a slightly higher diastatic activity than those receiving boron, results being in the ratio of 150-138.5 for the sour orange cuttings as against 131-120 for Eureka lemon on rough lemon. The results suggest a further reason for the rapid recovery of formerly boron-deficient citrus and the simultaneous rapid decrease in the carbohydrate content of the leaves.

370. **Reed, H. S. and Hirano, E.** 634.3 : 581.12

The density of stomata in citrus leaves.

J. Agr. Res., 1931, 43 : 209-22.

Studies made mainly on Valencia orange (*C. sinensis*) leaves from shoots grown on south side of trees in previous year in full sunlight. Among the points noted are : Stomata are produced during the early stages of leaf development and are confined to the ventral surface of the lamina. They are more abundant in lemon than in orange leaves. The coefficient of correlation between the average size of mature lemon leaves and the density of stomata was $-.307 \pm .004$. The maximum growth in area of orange leaves is near the centre of the lamina, the minimum near the apex. The density of stomata on the leaves of lemon shoots shows a certain relationship to the position of the leaves on long shoots. The size of stomata seems to be only slightly influenced by the number per unit area. The density of stomata is reduced by reduction in light intensity.

371. **Uphof, J. C. Th.** 634.3 : 581.45

Wissenschaftliche Beobachtungen und Versuche an Agrumen. II—Die Morphologie des Blattes. (Notes and experiments on citrus varieties. II—Leaf-morphology.)†

Gartenbauwissenschaft, 1931, 5 : 477-507, bibl. 14.

A continuation of the author's previous article in the same journal, Vol. 4 : 513-20. His observations were made in Florida at the National Herbarium of Washington, D.C., at the Herbaria of the Botanical Institute of Berlin University, of the Natural History Museum at Paris, and of Kew. An exhaustive study was made not only of the works of the old authorities but of the actual leaves of every available variety of citrus. Illustrations are given of many of these. He remarks in his conclusion :—We get here repeated inheritance of the variation of the simple unarticulated leaf, and of the articulated leaf, ranging from one where the articulation consists of only one end leaflet, to the leaf which is formed of more than one leaflet. In some species of the same genus we find very constant leaf forms with simple leaves, others have different degrees of compound leaves; while some species sometimes show every sort of leaf form even on the same branch.

* 76, 267.

† 172.

372. Seeley, W. H.**634.334-1.67**

A successful method of operating lemons under overhead irrigation.

Calif. Citrograph, 1931, 17 : 34.

The grove consists of Eureka lemon trees 45 years old growing in decomposed granite soil at Sierra Madre, California. Overhead sprinklers were installed 9 years ago, each sprinkler covering four trees. Once each month throughout the dry season 3 acre-inches of water is applied through the sprinklers, falling like a light rain on the trees. The irrigation lasts twelve hours and penetrates to a depth of 4-4½ ft. One acre-inch is applied between regular irrigations for the benefit of cover crops. Two cover crops are raised and ploughed in annually and formerly nitrate of lime was applied in addition. Rain water contains nitrogen in solution. It was found that the water from the sprinklers, after passage through the air had practically the same analysis as rain water in contradistinction to its analysis before leaving the hydrant. From this it is considered that it will be possible to keep the soil in practically virgin condition by constant cover cropping, supplying moisture at the right time, together with the nitrogen absorbed by water from the sprinklers as it falls through the air.

373. Blatt, R. J.**634.3-1.67**

The furrow-manure method of fertilizing citrus groves.

South African Fruit Grower, 1931, 18 : 173-5.

Many orchards in South Africa produce less than one case of payable fruit per tree. It is here contended that by the system of furrow-manuring accompanied by proper irrigation the yield can be raised in one year to at least two cases per tree and often more. In the rainy season when implement work is difficult, labour, otherwise probably idle, can be set to dig trenches between the trees. These should be 2½ to 3 ft. deep and 1 ft. wide. When ready they are filled with farmyard manure well mixed with soil to within 12 inches of the surface and are then covered in. The value of placing the manure in a trench lies in the fact that the manure is confined in an area below the ploughsole and the mass of rootlets growing in the manure area is never disturbed. There is less danger of the rootlets drying out because the moisture is retained in the manure and the manured area takes water more readily than unmanured portions. From five to ten tons may be given per acre. It is advisable at first to plough across the trench, but when the soil is well settled the direction of ploughing is immaterial.

374. Quinn, G. and Fotheringham, N. S.**634.3.-1.8**

Citrus experiments at the State experiment orchard, Berri.

J. Dept. Agr. South Australia, 1931, 34 : 1248-54.

An account of treatments given and results obtained to date in fertilizer experiments started in 1920 on Washington navel trees planted at Berri in 1912. The exact species used for stock and the origin of the buds is unknown. The soil depth varies greatly. The surface of the phosphatic area is a gentle slope to the South-West by South, while that of the area receiving nitrogen and potash faces South-East. Fertilizers are applied as follows : A furrow is ploughed 7-8" deep along each side of the row of trees, skirting the spread of the boughs in the direction of the water run. Owing to the steepness of the slopes the water cannot in most instances be directed diagonally across the spaces between so as to soak the soil evenly around the trees. The fertilizers are distributed along the bottom of the furrow and another furrow slice is turned over it. The irrigation water is then run down this second furrow until it has thoroughly soaked through the bank covering the fertilizer. The fertilizer has been applied half in early spring, half at midsummer. Fifteen different treatments are being tested. The experiment has disclosed many "off type" trees, which were particularly noticeable, where appreciable response to fertilizers occurred. The experiment has shown that the most limiting factor to the growth and productiveness of citrus in the Murray valley is restricted nitrogen supply. In no instance where this element was omitted, or where inadequate amounts were supplied, was there any consistent response in the form of improved tree condition or cropping capacity.

In 1929 nitrogenous fertilizers were applied to plots which had previously received none of this element. The improved growth and general appearance has been most marked. Tables are given showing fertilizer applications and yields up to 1930.

375. Blanchard, V. F. 634.3-1.538

Renewal of citrus orchards.

Calif. Citrograph, 1931, **16** : 549, 584-5.

After ten to fourteen years lemons on sour orange stock tend to decline, showing sparse yellow foliage, weak wood, die back and low production of inferior fruit. The feeder root system becomes depleted. The trees take on much the same appearance as over-irrigated trees, but that this is not the cause is proved by the injury manifesting itself in scattered trees and not uniformly over the orchard. The feeder root system becomes depleted. There is an earlier decline on loam soils with high moisture holding capacity than on more open well drained soils, but even in the latter the decline becomes evident sooner or later. These trees can generally be restored to health by a heavy cutting back, removing two-thirds of the tops. Lighter pruning has little effect. The permanence of the results of this treatment has yet to be shown. Some growers only allow the trees stimulated into production by severe pruning to stand long enough to balance the expense of a fresh planting on sweet stock (which does not show this decline), removing the treated trees later in the expectation that they will eventually again become unprofitable. The phenomenon is evidently related to soil moisture content, and since the sour orange is particularly susceptible to excess moisture, their period of usefulness may be prolonged by allowing the moisture content to approach the wilting point before applying water, thus providing better aeration and favourable conditions for feeder root development.

376. Mehlitz, A. 634.321-1.576

Ueber die Verwertbarkeit der Früchte von *Citrus trifoliata*. (Utilization of the fruits of *C. trifoliata*.)

Gartenbauwissenschaft, 1931, **5** : 568-73, bibl. 6.

C. trifoliata is grown in Southern Germany for ornamental purposes. Analyses and experiment with the fruit lead the author to the following conclusions. Skins, flesh, core and rag can be utilized. From the skin can be made a very aromatic flavouring for cooking. The rag, flesh and core contain large quantities of pectin of high jellying capacity. This is easily extracted and can be used for jellying.

377. Reichert, I. and Perlberger, J. 634.3-2.1

Little leaf disease of citrus trees and its causes.

Hadar, 1931, **4** : 193-4.

Abnormal growth appeared on young citrus trees in Palestine. The leaves were small and brittle and burned at the tips. Instead of bending slightly downwards the leaves stood upright and the branches had short joints. General appearance was poor and dwarfed. Abnormally heavy blossoming occurred two years before the normal time. The fruit was mis-shapen. In 1928, an exceptionally dry year with an exceptionally long period of hot winds, the disease became epidemic. No organism to cause the disease was found. Analysis of the ash content of the leaves indicated a deficiency of potassium, which was corroborated by a special test of the sugar contents of the fruits, the amount of sugar in the fruit being in direct proportion to amount of potassium available in the plant. The peculiar feature of the little leaf disease, distinguishing it from other drought diseases associated with potassium deficiency, is that the tissue of the affected trees remains uninjured apart from the scorching of the leaf tips which disappears later on. The injury rather manifests itself in the form of a change from a mesophytic habitus, its normal condition, to a xerophytic habitus. This was confirmed by refractometer tests which showed a higher sap concentration in the leaves of the injured plants, a characteristic, according to Fitting and others, of xerophytic plants. This kind of drought

injury, wherein a change from a mesophytic to a xeromorphic state takes place, is new to plant pathology. It may be called xeromorphosis to distinguish it from other little leaf diseases due merely to nutritional disturbances.

378. **Casella, Prof.**

634.63-1.535

Propagazione dell' olivo per gemma. (A new method of olive propagation.)

L'Agricoltura Coloniale, 1931, 25 : 480-1.

A short account of the method given in a lecture by Casella at Portici. Prunings of smooth, shining bark, 2-6 cm. in diameter, absolutely healthy, and of good quality, are taken. The twigs are removed and the prunings cut into 5-10 cm. lengths, which are stratified in sand, where they are kept till their removal into the nursery at the end of March or beginning of April. Here furrows are made 20 cm. deep and the same wide, at a distance of 70 cm. from each other. The cuttings are set in them either vertically or horizontally, at 15 cm. apart and are covered with 6-10 cm. of fine soil, on which is put a layer of 1-2 cm. of chaff or chopped straw or cow or horse manure. Watering is advisable. On the emergence of buds, all except the strongest from each cutting are removed by tipping with the nail a few cm. below ground level. The resultant young plants need weeding, occasional irrigation and systematic removal of shoots. In the autumn of the first year, or better in the spring following, the young plants are pulled up, removed from the original cutting, tipped at the height at which branching is desired, and put, after disinfecting the wounds with ferrous sulphate, at 0.50 x 1.0 m. in a second nursery. In the autumn or spring of the 2nd or 3rd year of propagation the plants may be moved to their permanent quarters. Casella's experiments lead him to consider that such plants are the equal of or superior to those got from seed or by grafting. He states, moreover, that they are less sensitive to transplanting, are quick growing, vigorous, taprooted, reach maximum productivity in a short time and retain this maximum for a very long time.

379. **Blatt, R. J.**

634.653

The latest development in avocado growing.

South African Fruit Grower, 1931, 18 : 199-203.

Stresses the advantages for South Africa of growing only the Mexican and Guatemalan varieties as opposed to the West Indian. The average price received by the Californian growers for the former varieties recently averaged 1s. 3d. per lb., while the West Indian varieties were selling at only 2d. per lb. The Mexican and Guatemalan varieties on Mexican stocks come into bearing in the 3rd or 4th year, while the West Indian seedling trees take about 10 years. Two varieties, Dickey A and Linda, not recommended in California for commercial planting, should nevertheless pay well in South Africa since they come in at a time when there are few West Indian avocados on the local markets. A long quotation from the report of the Variety Committee of the California Avocado Association follows, discussing chiefly the characteristics of the leading commercial varieties. A point made here on the analogy of the banana is that a fruit which shows signs of decay outside first is more likely to be a commercial success than one which decays inside while having its exterior still unblemished. The Fuerte avocado has the former peculiarity and this gives it extra marketability over other sorts.

TROPICAL CROPS.*

380. **Imperial Institute.**

63(072)

Recent research on Empire products. A record of work conducted by government technical departments overseas.

Bull. Imp. Inst., 1931, 29 : 185-228.

A summary of some of the experimental work now in hand in agricultural and horticultural crops. The countries represented are:—*Ceylon*—cacao (pollen germination), coffee (comparative yields of varieties), Jak Fruit, *Artocarpus integrifolia* (a Bombycid moth pest), pineapples

* See also 422-424.

(report of a five years' trial to ascertain probable returns and expenses on a small holding), coconuts (investigations on the life cycle of the red weevil, *Rhynchophorus ferrugineus*), kapok (a new weevil pest), hevea (mycological and entomological report), tobacco (virus diseases). *Malaya*—Tea (experimental cultivation), copra (nut harvesting, drying, baling), oil palm (manurial, breeding, factory work). *Nigeria*—cacao (fermentation, spoilage of stored cacao), groundnuts (yield trials), cotton (intercropping with yams, jassid resistant strains). *Leeward Islands, Dominica*—investigation of causes relative to the decline of seedling lime industry. *Antigua*—gumming disease of sugar.

381. **Evans, G.** 63(072)(72.9)

The Imperial College of Tropical Agriculture. A survey of its work.

West India Committee Circ., 1931, 46: 371-2.

A report of a speech made by the Principal of the College, Mr. G. Evans, to the West Indian Club, London. He emphasized the fact that the College is now the recognized training centre for candidates for the Colonial Agricultural services. The main crops on which research was being carried out were sugar, bananas, cocoa and citrus. The soil survey technique which had been evolved as a result of the sugar cane froghopper investigations was now being adopted in other countries. In cocoa the matter of vegetative propagation was receiving close attention. The speaker believed that cocoa should be treated intensively as an orchard rather than a forest crop, and that this would not be economically possible until the present average yield of 10 pods per tree had been considerably raised. Efforts were being made to evolve high yielding types which could be propagated vegetatively on an extensive scale for distribution. On citrus the work was mainly concerned with rootstocks. A unique collection of banana varieties had been got together and new hybrids raised. More land was urgently needed for permanent plantations of these and of the new types raised in other crops.

382. **Joachim, A. W. R.** 631.874(54.8)

The principles of green manuring and their application in Ceylon.

Trop. Agriculturist, 1931, 77: 4-31, bibl. 33.

The analytical composition of certain plants, leguminous as well as non-leguminous, used in Ceylon for green manuring is tabulated and compared, and the conditions under which either class may be used as green manures explained. The results of investigation on the variation of composition with age are also briefly summarized. The principles underlying the decomposition of green manures in soils under both aerobic and anaerobic conditions are then discussed, and the results of experimental work on the subject in Ceylon outlined. The chapter concludes with discussions on certain practical green manuring problems, viz. soil and climatic conditions suitable for the growth of green manures, the optimum time for cutting and forking in, measures to be adopted for securing a good growth, some of the limitations of the system, green manuring practices on Ceylon estates and the respects, if any, in which they may be advantageously modified. [From author's summary.]

383. **Holland, T. H.** 631.874: 633.72/74

The green manuring of tea, coffee and cacao.

Trop. Agriculturist, 1931, 77: 71-98, 139-66, 197-218, bibl. 35.

The green manuring of tea, coffee and cacao is dealt with in these pages, and the material available for use is classified under Trees, Shrubs and Ground Cover Plants. The general claims of each section are put forward in turn and thoroughly discussed. A very full list of suitable plants in each category is given together with most informative notes on the habits, culture and general suitability of the individual species named. Although not mentioned in the title there is included a full discussion on the advantages or otherwise of shade for coffee and cacao. Coffee should be lightly shaded, too much shade reducing the crop. *Grevillea*

robusta is one of the best trees for the purpose. In regard to the shading of cacao, which has been a controversial subject for years, it is universally agreed that young cacao must be shaded for the first two or three years. Various authorities are then cited for and against the practice with mature cacao, the author agreeing with Wright* that if shade trees are regularly lopped in dull weather and allowed to develop and retain their full foliage during hot, dry weather, the leaves which have accumulated on the ground will then serve as a mulch and check evaporation with beneficial results to the crop. The paper is well illustrated with photographs.

384. **Miller, R. W. R.**

633.526.23

Sisal.

Trop. Agriculture, 1931, 8: 289-92.

A general description of the methods of sisal growing. The sisal plant produces a greater quantity of fibre during the dry season, therefore a sisal estate should be in a district where, whatever the annual rainfall, there are several months of the year in which the precipitation does not exceed two inches. Bulbils produced on the inflorescence when the plant poles will tend to produce exactly similar plants to the parents and by a proper selection of parents (subsequently leaving them to grow naturally without cutting, until they pole) the yield may be raised from 10-15 per cent. per acre. Suckers produced on the underground stems are extremely variable, as Dr. Karl Braun, then of the Amani Research Institute, recorded in 1908, after a series of yield experiments. Bulbils require twelve months to produce an adequate root system, while suckers can do it in six. Two weedings are made per annum, but there is now a tendency to use a cover crop of bush beans, which will provide a change of diet for the labourers and can be subsequently turned in. Manuring is not practised and since less than a ton of fibre is obtained per acre per annum it would probably prove uneconomical.

385. **Nutman, F. J.**

633.526.23(67.6)

The field for sisal research in East Africa.

Bull. Imp. Inst., 1931, 29: 299-307.

This paper is written with the idea of drawing the attention of workers to the numerous and interesting problems concerning sisal, a crop on which practically no research has been done. Physiological problems are mainly dealt with here, but those connected with agronomy and genetics are stated to offer an even wider field of work. Some of the points needing investigation are:—The causes of "poling" or fruiting, can it be delayed or hastened? What factors lead to seed production in sisal, and why does the plant not set fruit under normal conditions? What factors cause the production or suppression of "suckers"? Suckers are produced on underground stems of some length which do not die off until the death of the parent plant, although the suckers have their own well developed root system. The influence of the parent plant on the suckers is often very marked, a parent plant which poles causing all the attendant suckers to pole also. Small suckers with rudimentary poles will, if removed from the parent, develop vegetatively. The author has never seen a poling sucker attached to a non-poling parent. He thinks this influence of the parent on the sucker could be turned to profitable account when properly understood. The water relations of the plant? Is the sisal as resistant to drought as is imagined, and if varietal drought resistance exists, what is its physiological basis? What are the factors determining fibre yields and are the yields correlated with soil differences? To these questions the author propounds tentative hypotheses which he thinks might form a basis of investigation.

* Wright, H. *Theobroma Cacao* or Cocoa. Ferguson, Colombo, 1907.

386. **Wellensiek, S. J.** 633.72-1.535
 Voorloopige aantekening over het stekken van thee. (Preliminary note on the propagation of tea by cuttings.) [English summary.]
De Bergcultures, 1931, 5 : 621.

Two new methods of making tea cuttings are described. The East Malling Research Station method of etiolated cuttings was practised by earthing up stumps and by planting the etiolated shoots which arose below the soil. Root formation started after 30 days. Following a German method, worked out by Hosterman, a ring of iron wire was fastened round young shoots of about 3 months old close to the main stem and their bases earthed up. Vigorous root formation was in progress within 36 days. It is hoped that these methods will be of use in propagating selected plants vegetatively. [From author's summary.]

387. **Cooper, H. R.** 633.72-1.55
 Plucking for quality.
Indian Tea Association Scientific Dept. Q.J., 1931, pp. 53-74.

It is considered that at the present time quality in tea shows a better return than quantity. This paper discusses methods of pruning to achieve quality economically. It concludes with a "Garden Calendar" for the cultivation of tea month by month.

388. **Biggs, C. E. J.** 633.73-1.542
 Bugusege Coffee Plantation.
Ann. Rept. Dept. Agr. Uganda Protectorate for 1930, part 2, pp. 20-22.

Recounts briefly experiments with Arabica coffee. A comparison was made between the yields of coffee pruned on the single stem, multiple stem and Agobiada* systems. At first single stem showed marked superiority over the other two methods, but topping at 5 ft. so reduced the leaf area as to prevent the tree recuperating after bearing and many died. Of the mean totals of the remaining two picks the Agobiada treatment is significantly the better. Further experiments are now in progress to test a simple multiple stem against the single stem and against natural growth. The proposed layout of experiments on shade, spacing, manuring for 1931 are described.

389. **Snowden, J. D.** 633.73-1.541
 Coffee. (Notes on vegetative propagation.)
Ann. Rept. Dept. Agr. Uganda Protectorate for 1930, part 2, pp. 70-71.

The first stocks used were cut off the trees and after cleft grafting with selected scions placed upright in water (changed daily) without nutrient. It was found possible to keep many of these shoots alive until union had taken place, and in some cases until the buds of the scion had developed into leaves. These experiments showed that, unless the ties were removed from the grafts within about 21 days after grafting, they became too tight and cut into the stock. Test tubes were placed over the grafts and it was found that the scions often kept alive for two weeks without union having taken place, but, if the test tubes were removed before union had been effected, the scions immediately shrivelled up and died. Scions which survived for 21 days were usually successfully united. More success with "water grafts" was obtained when the covering test tubes were painted white. Subsequent trials using rooted stocks failed to confirm this. Further experiments with rooted stocks growing in banana fibre pots indicated that certain factors had an important bearing on success. Briefly stated the stock and scion must be of equal thickness; the scion must not be hard and dry nor yet soft and sappy; the point of grafting should be situated as near to the middle of the test tube as possible; the stock wood should be brown rather than green at the point of grafting, otherwise there is not the same

* "Agobiada" means "bent over." Year old plants are bent over and pegged down, any primaries which touch the ground being cut away. Suckers then spring up vertically on the bent over portion. Three or four are selected as far apart as possible and the remainder removed.

tendency for the cleft stock to spring together and grip the scion tightly, while the young buds are apt to attract the sap away from the scion ; the scion wood should be quite sound, since any superficial fungous disease will develop rapidly in the moist air in the test tube.

390. **van Hall, C. J. J.** **633.74(92.2)**

De Herleving van de Cacaocultuur in Ned. Indië en de Invoer van Cacao-Variëteiten uit andere Landen. (The revival of cacao cultivation in the Dutch East Indies and the importation of cacao varieties from abroad.) *Berichten van de Afdeling Handelsmuseum van de Kon. Vereeniging Koloniaal Inst.*, No. 58, pp. 9. [Abs. *Kew Bull.*, 1931, 8: 429-30.]

The fine quality of Java cacao is due to its strong Criollo characteristics. In various cacao producing countries the tendency has been for the Criollo type to be supplanted by Forastero types, resulting invariably in a lowering of the average or relative price of the exported beans, as for instance in Trinidad. The prices of Java cacao over a period of years have generally been more than double or even three times the price realized by West African. In addition the price of the high grade cacao is stable and not subject to fluctuation as in the lower grades. Up to 1900 Java cacao was of more or less pure Criollo type, but after that beans of a hybrid or mixed nature began to be marketed. With the decline in the price of rubber a revival of interest in cacao cultivation is noticeable.

391. **Malins-Smith, W. M.** **633.74**

The sanitation of the cacao field.
Proc. Agr. Soc. Trinidad and Tobago, 1931, 31: 293-7.

The gradual elimination of shade trees until they number but 8 to the acre is advocated ; these should be young and free from mosses and other foreign growths. The cacao trees should be pruned to encourage a good head of growth, the aim being to obtain a full and complete canopy of foliage over the entire field to shade the trunks and the whole surface of the soil. The space beneath the canopy should be kept free of twigs and drooping branches, and every branch, the leaves of which cannot reach the sunlight, should be removed. The need of adequate tillage is emphasized. Where this is lacking the soil compacts and the cacao tree forms a sieve-like mass of roots (locally known as "beeshay") close to the surface, causing the tree to suffer in times of drought and to have a tendency to fall over in times of excessive rain.

392. **Pyke, E. E.** **633.74-1.535.4**

Cacao propagation. The vegetative propagation of *Theobroma Cacao* by soft wood cuttings.

Trop. Agriculture, 1931, 8: 249.

The cuttings were inserted in coarse sand in a solar propagator (described *ibid.*, pp. 90-93, R. E. Hunter, H.A. 368). Bottom heat was thus assured. Transpiration was checked by using cuttings with mature leaves and keeping the air round the cuttings humid. The latter was effected by placing porous pots filled with water at 1 ft. intervals among the cuttings, their bases being just in the sand. A double layer of cloth was then spread over the top and kept moist, thus enclosing the cuttings in a sort of tent [it is not stated what amount of light could penetrate the cloth.—ED.]. The material for cuttings was taken soon after the leaves had become mature, the stems being hard but still green, six inches being a suitable length. When taken in the field the cuttings were brought in with a section of hard wood attached. This was removed at the time of insertion in the rooting medium together with the lowest leaf on the green wood. [It is not stated whether the position of the final cut, i.e. just below a joint, or internodal, was significant.—ED.] Air tight boxes were used to convey the cuttings from the field to the frame. In three weeks, provided the leaves had been retained, the cuttings had callused and some had rooted just above the callus. In four or five weeks cuttings were well rooted and fit for potting up. At this stage the rooted cuttings showed some reluctance to put forth new

top growth and several died without making fresh leaves, possibly owing to an insufficient food reserve. In all the rooted stems of cacao examined the young root started as a small spherical tumour of growing cells in the Lohden wedge, always opposite to a wide medullary ray. It elongated and broadened, displacing the stem tissues, and soon had a well marked root cap and a vascular tract, which linked up with the wood and phloem of the stem. A photograph illustrates this process.

393. de Belsunce, G. 633.85

Sur l'arbre à toung et l'huile de toung. (The tung oil tree and its oil.)

Bull. Mat. Grass., 1931, 5: 178-94, bibl. 10.

A résumé of facts known about *Aleurites Fordii*, its cultivation and oil, as also of the processing of the oil and its various uses. Its small scale cultivation in Florida is quite inadequate to supply the demands of the U.S.A., and the author notes the recent efforts to increase its production in Kenya and other parts of the British Empire. He considers that the French Colonies, which at present produce none, could well produce the commodity on a large scale.

394. van Hall, C. J. J. 633.912

Review of the most important publications on rubber culture issued in 1930.

Int. Rev. Agr., 1931, 22T., 212-218, 258-69, bibl. 56.

The publications are classified under—economy, botanical investigation, sowing out, soil and manuring, mixed cultivation, tapping, rejuvenation and replanting, selection. Much of the work is shortly summarized. The classified bibliography of 56 should prove useful for reference.

395. Vollema, J. S. 633.912 : 581.084.2

Over de methodiek van veldproeven in de rubbercultuur. (On methods of field experimentation with rubber.)

Archief voor de Rubbercultuur in Ned. Ind., 1931, 15: 391-422, bibl. 13.

Since 1924 experiments in West Java fall into two classes, growth measurement and yield records. Nursery growth experiments can be laid out in plots of 250 plants replicated 4 to 6 times, which will reduce the standard error to 5%. Growth experiments in very young plantations should be arranged in plots or rows of 400-500 trees with 8 repetitions. In plantations of 2-3 years or older the same accuracy can be obtained with 150-200 trees and 8 repetitions. Yield experiments can be set out in two ways, the "strict" scheme whereby factors causing error, such as differences due to the idiosyncrasies of tappers, can be eliminated as far as possible, and the "practical" scheme in which the actual tapping tasks are used as experimental plots. Here the influence of tappers cannot be eliminated. The "strict" scheme, however, being difficult to supervise failed to come up to expectations. For rules for its conduct the reader is referred to certain publications named in the bibliography. The "practical" method was more successful. Advance records for about a year prior to the experiment are necessary. There should be 6 to 8 repetitions to find differences in yield of 5 per cent. with a standard error of not more than 5 per cent.

396. Ostendorf, F. W. and Ramaer, H. 633.912 : 581.45

Over den bladstand bij *Hevea brasiliensis*. (On phyllotaxis in Hevea.)

[English summary.]

Archief voor de Rubbercultuur in Ned. Ind., 1931, 15: 423-40.

The phyllotaxis of individual clones was examined in the hope that any differences between clones might be used as a means of identification, buds as well as shoots being included in the investigation. The phyllotaxis and parastichies are described. The latter falls into two systems named by the authors (2+3) and (3+4), with divergences of 138° and 103° respectively. These systems always showing the same typical divergence value are possible in all

clones and the direction of the genetic spiral depends purely on chance. The conclusion is drawn that phyllotaxis does not provide any identification characteristics for clones. Possibly, however, the characteristic of "twisted growth," which is only indirectly related to phyllotaxis, may be found useful as an aid to identification.

397. Bobiloeff, W.

633.912-1.521

Kleurreacties van latex als identificatie-kenmerken van Hevea-cloonen.

(Colour-reactions of latex as a mark of identification of Hevea clones.)

[English summary.]

Archief voor de Rubbercultuur in Ned. Ind., 1931, 15 : 289-308, bibl. 5.

The addition of calcium salts to the latex taken from the young parts of hevea causes increased activity of the enzymes resulting in discoloration of the latex. This discoloration varies in colour intensity and the time taken to appear in each clone, and since these variations are practically constant, they can be used as a means of clone identification. The best results are obtained with a 1% solution of chloride of calcium. Since the reaction is restricted to young parts (preferably leaves one tier from the top of the shoot) the method cannot be used to identify budwood. In carrying out the test the following points have to be considered:— the colour nuance of the reaction as a whole and of its different phases, e.g. red, orange-red, blue, violet or grey, and the degree of intensity occurring in the flocculations; the colour reaction of the serum, which will probably differ from that of the coagulum; the time elapsing between the adding of the calcium chloride and the beginning of the reaction; peculiarities of structure in the resulting coagula. It is not, however, possible to make a definite determination table, since appreciation of the colours is somewhat subjective and any such table would be only of relative value.

398. Sanderson, A. R. and Haines, W. B.

633.912-1.537

Effect of covers and clearing methods on the growth of young rubber.

J. Rubber Res. Inst. Malaya, 1931, 3 : 28-35.

The results of comparisons of growth on 5 blocks of 18 months Hevea trees at Sungei Buloh Experiment Station. Basket plants gave about 20 per cent. better results than seed at stakes. Stumps were very slightly inferior to basket plants. Clean weeded plots have consistently made better growth than those under cover crops. The effect of leaving timber lying has been decidedly beneficial.

399. Mann, C. E. T.

633.912-1.541.12

Further observations on planting systems for budding of tested clones.

J. Rubber Res. Inst. Malaya, 1931, 3 : 48-53.

Three planting systems are discussed. (1) Block or monoclonal planting, in which the most desirable clone alone is used. (2) Mixed planting, using buddings of a number of promising clones mixed in the same area in equal proportions. (3) Mixed planting, in which half the planting consists of buddings of a single well tested clone, and alternate plants are buddings of one or more promising clones not yet sufficiently well tested for monoclonal planting. The advantages and disadvantages of each system are tabulated and it is decided that the advantages of the monoclonal system as applied to the oldest test clones considerably outweigh its disadvantages.

400. Summers, F.

633.912-1.541.11-1.55

Influence of the stock on the growth and yield of budded rubber trees.

India-Rubber J., 1931, 82 : 9-11.

The only practical method at present of producing a stand of uniformly high yielding trees is that of budding from proved clones. Analysing recent communications of Cramer (9th Internat. Hort. Congress, London, 1930) and Heusser (*Archief voor de Rubbercultuur*, August, 1930) the following conclusions may be drawn. (1) The stock is able to influence the rate of

growth of budded rubber but unable to influence its productivity. (2) By a suitable choice of stock material it should be possible to obtain budded trees which at maturity are better examples vegetatively than the mother tree, so that strongly grown buddings could be obtained from a poorly grown mother tree. (3) There is no evidence of any close connection between the productivity of a tree and its vegetative character. (4) Buddings are repetitions of and not improvements on the mother tree. The reasons for these conclusions are carefully argued in the course of the article.

401. **Georgi, C. D. V.** 633.855.34-1.8

The removal of plant nutrients in oil palm cultivation.

Malayan Agr. J., 1931, 19: 484-9.

An attempt to estimate the amount of plant nutrients extracted annually from the soil in the course of ordinary estate practice by the removal of leaves, male inflorescences and fruit bunches of the oil palm. The combined average totals of nutrient removal per acre per annum of the above material by the plants under experiment (palms 6-7 years old planted 56 to the acre) was nitrogen 90 lbs., phosphate as P_2O_5 , 20 lbs., potash as K_2O , 112 lbs.

402. **Cooke, F. C.** 634.61-1.55

The harvesting of coconuts for copra production in Malaya.

Malayan Agr. J., 1931, 19: 477-83, bibl. 8.

An attempt is made to determine the effect of nut ripeness on oil content. For reasons which vary with the locality nuts are generally gathered before they are properly ripe. For this experiment two estates were selected in each of the three main coconut producing districts of the country and the mixed crop as normally harvested was graded for ripeness, eight classes or degrees being arbitrarily distinguished. One hundred nuts from each class on each estate were examined, 4,800 nuts in all. The results were statistically examined and the accumulated results are sufficiently significant to justify certain conclusions. *Copra yield.* The yield of dry copra steadily increased through the underripe stages until full maturity was reached, after which it began to decline owing to the embryo development. The maximum yield (19 per cent. more than the green nuts) is obtained with nuts at the stage when they contain a haustorium about the size of a small apple, which is their usual condition at natural nut fall. *Percentage oil content.* Analyses of oil content of the copra gave unexpected results and demonstrated that ripeness is not a factor materially affecting the percentage of oil in commercial copra. It was shown that, if unripe nuts were no longer collected, the percentage of oil content of the copra derived from ripe nuts alone would show only a fractional increase over previous figures. It is suggested in explanation that the solids other than fat in coconut meat are liable to show decomposition on the kiln during the drying process, and that this instability is greatest in the immature tissue of green nuts; thus the percentage of oil is artificially increased by the reduction of the weight of solids other than fat in the copra. *Oil yield.* To obtain the highest oil yield per acre nuts should be collected containing a haustorium not less than 1 inch and not exceeding 2 inches in diameter. *Loss of copra by existing methods of harvesting.* Figures are given to show that by improving the harvesting methods to allow for increased natural nutfall, with the consequent reduced cost of picking and the improvement in quality of the copra due to the exclusion of unripe and overripe nuts, a considerable financial advantage could be expected.

403. **Bowman, G. F.** 634.772-1.52/54

Propagation of the banana.

United Fruit Company, Boston, Mass. Research Dept. bull. 35, 1931, pp. 15.

Reports a series of experiments to determine on clay soil under favourable growing conditions percentages of germination, relative growth rates, time from planting to shooting and size

of bunch produced by plants from 12 different types of propagating material. In order to eliminate all but one variable, only one plant was allowed to develop from any one portion planted. In the result, sword suckers while producing the largest fruit were slow in forming shade and produced only one plant per mat in the first generation. Heart suckers produced fruit and shade more quickly than any other type but with smaller bunches than sword suckers. The bunches grown from heads taken from plants which had already matured fruit were somewhat smaller than those propagated from maiden plants, but both were satisfactory. 8-10 lb. bits (standard planting size) produced a greater number of hands per plant than any other except those from sword suckers and from large heads from plants not yet shot. 1-2 lb. bits having a single eye were not satisfactory. Water suckers, generally considered unsuitable, produced only one hand per stem less than sword suckers. An important point brought out is that all materials tried except one pound bits and small bits from creeping rhizomes, if given favourable growing conditions, will produce healthy young plants capable of bearing marketable fruit. On account of Panama disease it is recommended that for reclamation planting maiden heads from 12 to 20 lbs. in weight should be used, since it has been shown that the disease is easily and rapidly spread through contact of infected soil with a cut portion of the central cylinder tissue. The results obtained are subjected to statistical analysis. There are a number of excellent photographs.

404. **Skutch, A. F.** 634.772-2.48 : 581.446.2
The anatomy of the rhizome of the banana in relation to infection by Panama disease.

United Fruit Company, Boston, Mass., Research Dept. bull. 36, 1931, pp. 7.

The external features are first described. The vascular system is next dealt with. Since Panama disease, *Fusarium cubense*, is carried through the plant chiefly in the tracheids of the vascular bundles, a knowledge of the course of these bundles is of importance to the understanding of the channels of infection. The technique employed in tracing the course of these bundles is detailed. The dermal system is next discussed. The unbroken surface of the rhizome is apparently an effective barrier to the entry of the fungi. Natural breaks in the surface occur so slowly that the production of cork beneath them keeps pace with the formation of the break. Possible places of entry for the disease spores are the scars left by the decay of the older leaf sheaths. They are covered by resistant tissues which begin to be formed before the sheath has decayed, but there is a possibility that there may be a brief period when they are still inadequately protected. The author emphasizes that, while the anatomical data are the results of direct observation, his conclusions are theoretical.

405. **Clark, Ll. H.** 634.774
Pineapple culture in the Eastern districts of the Cape Province.
Union S. Africa, Dept. Agr. pamphl. 102, 1931, pp. 16, bibl. 4.

An account of the methods recommended for growing and harvesting the Egyptian Queen and the Smooth Cayenne varieties, with notes on marketing, storing and export regulations.

406. **Collins, J. L. and Kerns, K. R.** 634.774 : 575.17
Genetic studies of the pineapple. I—A preliminary report upon the chromosome number and meiosis in seven pineapple varieties. (*Ananas sativus* Lindl.) and in *Bromelia pinguin* L.
*J. Hered.** 1931, 22 : 139-42, bibl. 4.

This paper forms the first of a series of genetic studies upon *A. sativus* and related species.

* Being technical paper 13 of the Exp. Sta. of the Asscn. Hawaiian Pineapple Cannery, University of Hawaii.

STORAGE.

407. West, C.

664.85.11.037

The cold storage of apples.

J. Min. Agr., 1931, 38: 585-93, bibl. 10.

The author thinks that the establishment of the Ditton Laboratory should allow results which have hitherto been qualitative to be put on a quantitative basis. No simple relation has been found between the constituents of the apple and keeping quality, though generally speaking long life has been associated with low nitrogen content. The technique of selecting comparable apples and of their examination is described. Data taken from a commercial orchard in Cambridgeshire suggest that considerable variation exists in keeping quality of fruit from different trees. In the differences noted, long life was found to be associated with low respiratory activity. The aim of cold storage is to retard the rate of change occurring in the ripening process, without altering it. Every apple possesses a critical lower limit which is slightly above the actual freezing point. A quantitative relationship has been established between the length of storage life and the temperature of storage of English apples. It is now generally recognized that there is an optimum temperature not only for each kind of fruit but also for each variety within its kind, depending on susceptibility to internal breakdown. As regards maturity at picking, it would appear that the highest percentage breakdown occurs, when apples are transferred to cold store temperatures near the peak in the rise of their respiration activity. Soil was found to affect strikingly the keeping quality of Bramley's Seedlings. Bramley's Seedling apples, even when fruit was of like size, taken from trees of under 10 years, did not keep so well as fruit from older trees. Notes are given on gas storage and precautions necessary to prevent scald. Gas storage is particularly valuable for varieties of apples susceptible to low temperature breakdown and may give far better results than cold storage alone.

408. Palmer, R. C.

664.85.11.037

Apple storage investigations.

Summerland Experimental Station, B.C., Rept. of Supt. for 1930, 1931, pp. 4-20.

The author summarizes his results from the commercial standpoint. The commercial life of an apple is influenced by soil and climate, by maturity at time of picking—the necessity for attention to this point is particularly stressed—, by treatment in the packing house, by promptness in cooling and conditions of storing. Keeping quality is also, within one variety, influenced by size and grade. A combination of suitable treatments and storage at 32°F. considerably prolongs the life of McIntosh, Delicious and Rome Beauty. Breakdown and Jonathan spot make a long storage of Jonathan precarious. Low temperature breakdown has sometimes been noted on storing Grimes Golden and Newtown at 32°F. Care is essential at every step between tree and consumer. Cold storage intelligently used gives the consumer a longer apple season.

409. "The Times."

664.8

British Canning Industry Number.

No. 45,982, *Supplement to The Times*, Nov. 17, 1931, pp. 20.

A symposium of articles on canning with special reference to canning in the United Kingdom. The following articles concern horticultural products:—"Home-grown fruits and vegetables," by H. V. Taylor, in which the progress of the industry in this country is described; "The chemistry of canning. How purity of preserved food is ensured," by B. T. P. Barker; "How foodstuffs are canned," Anon., being a popular account of the processes involved in canning fruit, vegetables, meat and fish; "Markets open to fruitgrowers. Types of produce required," by W. Lobjoit, in which notes on suitable varieties are given; "The national mark. Its

application to canning," by S. Machin; "Manufacture of syrups," by A. Wood. This deals with the use of home-grown canned goods in the tropics; "Business with the Dominions," Anon; "Food Canning Council. Work of the national organization. The fifth convention," by E. Jones.

410. **Tomkins, R. G.** 664.85.772
Wastage in banana transport.
Trop. Agriculture, 1931, 8: 255-64.

A study of the wastage in the refrigerated transport of Canary bananas from S. America to Europe. The methods used are in the main similar to those used to transport West Indian bananas. The causes of wastage most in evidence are (1) a stalk rot similar to that of Jamaican bananas but less serious and caused by a different fungus; (2) finger rotting following mechanical damage and spotting. Spotting appears to be specific to Brazilian bananas. It is described only from material available in England. "Ships ripens" and "chilling" are also encountered.

411. **Wardlaw, C. W. and McGuire, L. P.** 664.85.772
Banana storage. The behaviour and diseases of the banana in storage and transport with special reference to chilling.
Trop. Agriculture, 1931, 8: 139-47, bibl. 4.

The object of the investigations was to define the limits of chill with a view to corroborating finally previous recommendations of quick cooling as a preventive measure of main stalk rot and other sources of fungal wastage in banana cargoes. Storage trials at 50°F. and 52°F. have shown that chilling is a cumulative effect of duration of exposure and not a result of rapid cooling to such temperatures. The usual practice is for bananas to be carried on ships at a temperature of 53°F., to which temperature the cargo is reduced in four to five days. More rapid cooling is supposed to cause risk of chilling with failure to ripen regularly or ripening a dull colour. The present researches, however, have proved that this temperature is definitely not inimical, no matter how quickly it is reached, provided delivery temperature of the air is not lower than 53°F. It has been definitely established that the rapid cooling to 53°F. within 12 hours may be practised without danger of chilling during the usual voyage of 16-20 days. This will result in decreased wastage due to retarded fungal activity. Lower temperatures than 53°F. are not recommended owing to the slower ripening giving more time for fungal activity. Prestorage, nutritional, time and temperature factors are of fundamental importance in determining the extent of wastage due to fungal activity in banana cargoes. In particular the longer storage trials at 52°F. and 51°F. stress the importance of the time factor in this connection.

412. **Bracewell, Mary F. and others.** 634.11:577.16
The antiscorbutic potency of apples*—II and III.
Bioch. J., 1931, 25: 138-43, bibl. 4 and 144-6, bibl. 2.

Results are given of tests on two varieties not tested previously by the authors. Newton Wonder apples showed a vitamin C content of the order of that shown by Cox's Orange Pippin, while Lane's Prince Albert was intermediate between this and Bramley's Seedling. Bramley's Seedlings can be frozen at -20°C. and stored 4 months without appreciable loss in antiscorbutic activity. The same apples are not more active per g. picked in July than those picked in October. Stored in air at 3°C. for 5 months they do not lose any antiscorbutic activity. The concentration of vitamin C increases greatly on approaching the peel, where it is 6 times greater than in the flesh near the core. Whereas no significant disparity was found in the vitamin C content of Bramley's Seedling apples containing high and low quantities of nitrogen, King Edward apples containing 0.0307% nitrogen were about 1.5 times as potent in this respect as apples of the same variety containing 0.0387% nitrogen.

* 303.

413. **Crane, M. B. and Zilva, S. S.** 634.11 : 577.16

The antiscorbutic vitamin of apples—IV.

J. Pom. Hort. Sci., 1931, 9 : 228-31, bibl. 3.

In previous trials by Bracewell and others the apples of Bramley's Seedling, a triploid, were much more potent than those of other varieties tested, which were all diploids. The authors tested two further triploids with the result that Belle de Boskoop apples were found equal in potency to those of Bramley, while those of Blenheim Orange gave results equal to those got previously with the diploid, Lane's Prince Albert. An attempt is being made to continue the investigation with other triploids.

414. **Bracewell, Mary F. and Zilva, S. S.** 634.32 : 577.16

Vitamin C in the orange and the grapefruit.

Bioch. J., 1931, 25 : 1081-9, bibl. 14

The authors' experiments confirm previous work and lead them to consider that such fruits bought casually in the market under normal conditions should possess the full antiscorbutic characteristics of those fruits. Picking early or late in the season did not affect vitamin content. Storing at 15°C. for 2 months resulted in no marked loss. The vitamin C content was not affected by conditions of cultivation, origin of stock, age of tree, soil, etc. There was only slight difference in potency observed between Duncan and Marsh grapefruit. The grapefruit examined showed rather higher vitamin content than the Jaffa orange.

PACKING, PROCESSING, FRUIT PRODUCTS.

415. **Cobb, A. J.** 634.11-1.564

Grading and packing fruit.

Gardener's Chronicle, 1931, 90 (3rd ser.) : 368-70.

The author stresses the necessity for cultivation practices which will ensure the production of fruit worth packing. He then discusses the best and most attractive ways of packing dessert apples in the whole box (capacity approx. 40 lbs.), half box and quarter box, and in the single layer tray, and how to allow for shrinkage in transit. He notes that packages used for low grade dessert and for cooking apples are wicker baskets or "sieves" and "half sieves" (corresponding in capacity to the whole and half boxes) and the half barrel, of about 56 lbs. weight when filled.

416. **Ministry of Agriculture.** 631.564 : 634.11 + 634.13

Apples and Pears: grading and marking.

Marketing Leaflet No. 7 (revised), 1931, pp. 19.

An account of the National Mark Scheme for these fruits drawn up jointly by the Ministry and the National Farmers' Union. A full description is given of the meaning of the different grades and of the general arrangements for carrying out the scheme, including the procedure and conditions to be observed by growers or packers authorized to apply the National Mark. A list is given of the standardized packages allowed and of the varieties of apples and pears to which alone the Mark may be applied.

417. **Anon.** 634.1/2-1.564

New crown pack device offered fruit industry.

Better Fruit, 1931, 26 : 3 : 12.

A description of a device whereby a crown pack can be obtained without bruising and flattening the apples. A heavy paper crown is placed at the bottom of the box, forming an arch. The apples placed thereon continue the arch right through the pack. When the lid is put on, the paper crown is flattened and the successive layers of fruit become firmly locked into place.

418. Gregory, J. H.**631.55/56 : 634.41 + 634.7**

Tropical fruits and strawberries. Harvesting, packing and marketing.

Queensland Agr. J., 1931, **36** : 281-9.

The fruits dealt with are the custard apple, papaw, *Monstera deliciosa* and strawberry. General principles such as the necessity for precooling, grading, care in making cases and attractive "get up" of packages are emphasized. Custard apples picked too soon turn black and become unsaleable. The fruit should be firm and mature. A good indication that the fruit is ready for picking is when the interstices between the corrugations of the fruit have turned a rich creamy colour. The best container is the dump half bushel case 18" \times 7 $\frac{1}{8}$ " \times 8 $\frac{3}{8}$ ". For large sized fruit with counts 8, 10, 12 and 14 the case should be made up the narrow way, 18" long \times 7 $\frac{1}{8}$ " wide \times 8 $\frac{3}{8}$ " deep, but for smaller fruits with counts 15, 18, 21, the wide way, 18" long \times 8 $\frac{3}{8}$ " wide \times 7 $\frac{1}{8}$ " deep is recommended. Owing to the irregular shape of the fruit a wider latitude in size variation is allowed than in the case of tomatoes or citrus. The points of the fruit at the opposite end to the stem soften first and should therefore be placed inwards away from the hard sides of the box. In packing for export a single layer tray 18" \times 11 $\frac{1}{2}$ " \times 5 $\frac{1}{4}$ " deep is best, with the fruit nested in woodwool. It is inadvisable to wrap the fruit, as this hastens ripening. Papaws should be packed for long distance travel in the tropical fruit case 24 $\frac{3}{4}$ " long \times 12" wide \times 12" deep. They should be wrapped in soft paper and bedded on their sides in woodwool. About five will occupy one case. For near-by markets the dump case 18" long \times 14 $\frac{1}{4}$ " wide \times 8 $\frac{3}{8}$ " deep is an attractive package. The fruit is packed end on in a single layer resting on a bed of woodwool. The bottom ends are wrapped in white or coloured paper to two-thirds of the way up to prevent rubbing, and the whole is made firm by pads of woodwool pushed among the fruit. *Monstera deliciosa* should not be harvested till mature; a strip of paper wrapped round the fruit keeps the outer shell from falling as the fruit ripens in the box. Fruit thus packed ripened over its entire length while still retaining its full flavour three weeks after picking. The standard half bushel case 18" long \times 11 $\frac{1}{2}$ " wide \times 5 $\frac{1}{4}$ " deep is an ideal case, the fruit being packed in layers between woodwool. Directions for packing strawberries follow.

419. Chace, E. M. and Poore, H. D.**663.815 : 664.85.037**

Quick-freezing citrus fruit juices and other fruit products. A preliminary report.

Indus. Engin. Chem., 1931, **23** : 1109-12, bibl. 10.

An account of the experimental freezing of nearly 1,000 packages of fruit juices and other fruit products at temperatures well below -10°F . The air was washed from some of the juices with CO_2 and CO_2 was used to fill the head space of other packages. This treatment of the juices did not result in marked effect on their flavour. With frozen fruits a slight improvement was noted when CO_2 was used. Freezing can readily be carried out in crown capped glass bottles, 4 or 8 oz., before or after capping and in 8 oz. glasses or 12 oz. jars with or without vacuum.

420. Freise, F. W.**633.73 : 661.731**

Preparation of vinegar from coffee fruit pulp.

Indus. Engin. Chem., 1931, **23** : 1108-9.

The pulp is mashed, pasteurized at 75°C . for 45-55 minutes, and then inoculated with a culture, e.g. *Saccharomyces octoporus*. The fermentation is complete in 12 days, when clarification follows. The liquid is then acidified in barrels filled with wood chips slaked in previously prepared strong vinegar, the temperature of the acidification room being kept at 35°C . The vinegar has a specific gravity of 1.0154, a total acid content, as acetic acid, of 4.60%, traces of ethyl alcohol, 3.67 grams of solids and 1.29 grams of ash in 100 cc., 0.97 grams or 75.2% of this ash being soluble.

421. **Youden, W. J.** 634.11-2.95
A nomogram for use in connection with Gutzeit arsenic determinations on apples.

Contrib. Boyce Thompson Inst., 1931, 3: 363-73, bibl. 8.

The author notes that previous work has given a reliable estimate of the analytical errors involved in this method. Sampling errors would appear to vary greatly and almost certainly exceed those of analysis. Statistical errors noted in previous work are discussed. A nomogram has been prepared which serves for estimating the precision of the procedure adopted.

NOTES ON BOOKS AND REPORTS.

422. **Howard, A. and Wad, Y. D.** 631.8
The waste products of agriculture.

1931, Oxford Univ. Press, pp. 167, bibliographies 12, 12, 13 and 4, 7/6.

The basis of every form of crop husbandry is soil fertility. Agriculture's greatest problem is how to conserve it. The author deplores the modern practice of mere replacement of minerals and neutralization of acidity in the soil with an almost complete disregard for the organic content of the soil. Having shown the inadequacy of present methods for replenishing the organic supply, he describes in detail with apt illustration the system of compost making adopted at Indore. The chief factors in successful manufacture and the disadvantages which may be expected from adverse weather conditions are amply discussed. The potentialities of the system for improving not only the soil but also the hygiene of native villages seem immense, but only where labour is very plentiful and cheap. Cheap and abundant labour is a prerequisite to success. As regards its use in temperate climates the author envisages the possibility of mechanizing the process and suggests possible methods of trial. Without mechanization high labour costs would make it impossible. Three interesting appendices add to the value of this most inspiring book.

423. **Elliott, E. C. and Whitehead, F. J.** 633.72(54.8)
Tea planting in Ceylon.

2nd. edit. 1931, Times of Ceylon Co., Ltd., pp. 313, Rs. 15.80.

The second edition of this book makes a welcome appearance at a time when, owing to extra-Empire competition and general overproduction, only those teas which stand out for quality above the general run can be expected to prove really remunerative. More than ever is close attention to all details in field and factory of the utmost importance and it must be the aim of all engaged in the industry to keep themselves abreast of the advances which are being made with such rapidity. In this they will be greatly helped by a perusal of the book under notice, since, as the authors state, it contains accounts and evaluations of all the recent innovations and improvements both in field and factory. Opinions on weeding have undergone a change. The case for and against clean weeding is argued and the compromise is suggested that a low growing leguminous plant such as clover could be planted between the rows and periodically forked into the ground with the manure. In plucking the adoption of a medium style is advocated, the flush being allowed to mature but not to harden up before being gathered. This will ensure a fair standard of quality without either restricting or forcing the yield per acre. The various styles of pruning are discussed but no hard and fast rules can be laid down owing to the differences of soil, climate, elevation and jat rendering no one method applicable to every district. Mention is made of Keiller's discovery that after drastic down-pruning very rapid callusing-over of the cuts can be ensured by the application just before or after pruning of an artificial manure mixture having a high content of quick acting nitrogen. The comprehensive chapter on manuring and cultivation concludes with the enumeration in tabular form of the principles, methods and objects of the manuring of tea as practised

in Ceylon. Referring to propagation mention is made of the shortage of seed due to the difficulty of growing a sufficient quantity in Ceylon, and the prohibition of imports of seed from India owing to blister mite. The suggestion is made that seed should be imported from Java and Sumatra. [Here it might be opportune to call attention to Wellensiek's article in *De Bergcultures*, 1931, 5 : 621, of which H.A. 386 is an abstract. Wellensiek has found that the tea plant will propagate easily and quickly by two stooling methods, thus eliminating the variation which must accompany seedling strains.—ED.] Pests and diseases are described and remedies suggested. The final chapters of the book deal with manufacture, buildings, machinery, etc., and contain full information on the latest ideas and innovations.

424. **Jacob, A. and Coyle, V.**

631.8

The use of fertilisers in tropical and sub-tropical agriculture, 1931. Ernest Benn Ltd., London, pp. 272, bibliographies, 10/—.

Information on the manuring of tropical and sub-tropical crops may be found by the diligent searcher among specialist periodicals and Department of Agriculture bulletins. The ordinary grower has little time or possibly inclination for this pursuit, and the authors have done him a very considerable service by collecting together in one book the most up-to-date information available. The first few chapters deal with fundamentals such as the nature and functions of fertilizers, composition of tropical soils and so on. Chapter 5 is devoted to descriptions of simple manurial experiments such as could easily be carried out by the planter without recourse to statisticians. In the remaining chapters each crop is taken in turn and its requirements considered. Unsubstantiated statements are not made, every pronouncement of importance being supported by data from the experiments leading up to it. A short bibliography of relevant publications is given at the head of each chapter.

425. **Confederazione Nazionale Fascista Agricoltori.**

634.87(45)

Le uve da tavola. (Table grapes.) 1930, 4to. Società anonima stabilimento, arti grafiche, Alfieri e Lacroix, Milan, pp. 110, Liras 40.

This beautifully and instructively illustrated tome is the first of a series of such works to be brought out by the C.N.F.A. and is the production of a specialist commission, composed of experts on the particular subject, Briganti, Longo, Prosperi, Musci, Racah and others. A short introduction gives the reasons for and method of carrying out the enquiry. Chapters 2, 3 and 4 deal with European trade. Chapter 5 gives detailed accounts of the best cultivation methods and suggestions for growing the most important Italian varieties together with a list of suitable rootstocks. The varieties dealt with are Chasselas doré, Panse precoce=Olivette precoce=Sicilien, Zibibbo=Muscat of Alexandria, Baresana=Varesana, Muscat of Terracina, Regina=Datte de Beirut, Italia, Bicanne=Panse jaune=Chasselas d'Alger, Ohanez=Almeria. Chapter 6 describes and makes recommendations on methods of harvesting, grading and packing. An interesting chapter follows on the methods of preserving table grapes and on systems suitable for growing late varieties or varieties with particularly good keeping qualities. Two appendices deal with the production of and trade in the Ohanez in Spain and of the growth of the Saint Jeannet, a late and remarkably good keeping variety, in France.

426. **Ministry of Agriculture and Others.**

63(42)

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom 1929-30, 1931, H.M. Stationery Office, London (for limited circulation), pp. 280.

Section C, Horticulture and Glasshouse Crops, pp. 53-99, gives an account of the investigational work in progress at the following English research stations:—Long Ashton, Bristol; East Malling; Horticultural Research Station, Cambridge; Experimental and Research Station, Cheshunt.

427. **Macoun, W. T.**

634/5(71)

Rept. of the Dominion Horticulturist for 1930, 1931, Dept. Agriculture, Ottawa, pp. 77. Brief accounts of work done at or in connection with the Dominion Experimental Farms in Canada in 1930, on the following :—Promising Crab apples originated at the Central Farm, including descriptions ; economic aspect of the closely planted wealthy orchard ; cultivation of the blueberry and its propagation from cuttings ; apple pollination work in Quebec ; fire-blight in Quebec and effect on it of fertilizers ; fertilizer pot culture experiments with apple trees ; manufacture of cider from Canadian apples ; report on cider making from Nova Scotia apples. A section deals with vegetable gardening. Results of work in progress in cucumber breeding for growing under glass are given. The last part is devoted to ornamental gardening, descriptions being given of different varieties of lilac, roses, lilies, climbing roses, tall bearded iris.

428. **Hunter, W. T.**

634/5(71.1)

Summerland Experimental Station, B.C., Rept. of Supt. for 1930, 1931, pp. 79. This report deals with the following activities of the Station :—*Apple storage investigations* (see H.A.408). *Stone fruit investigations*. On apricot, cherry, peach and prune varieties ; plum selection ; cherry pollination ; shipping, cold storage and pruning of prunes. *Plant breeding and vegetable production*. Breeding of asters, zinnias and tomatoes ; fertilizers for tomatoes and cantaloupes ; paper mulch experiments including one on a commercial scale for cantaloupes. *Horticultural products*. Apple juices, dehydration of apples, cherry canning problems including Maraschino cherries, the suitability of particular varieties of peaches, apricots, pears and prunes for canning. *Tobacco*.

INDEX OF NAMES

Horticultural Abstracts, Volume I

- Adriance, G. W., 169
 Agete, F., 295
 Albert, W. B., 273
 Allen, F. W., 37, 302
 Allison, J. R., 269
 Amos, J., 42, 62, 163
 Anon., 315, 344, 417
 Antoshin, S. T., 346
 Ashplant, H., 290
 Auchinleck, G., 94
- Barker, B. T. P., 112, 213
 Barker, J., 204, 208
 Barnardo, W. S. E., 171
 Barss, A. F., 137
 de la Bathe, H. P., 192
 Baur, E., 330
 de Belsunce, G., 393
 Bennett, J. P., 257
 Bensemann, E. C., 353
 Benton, R. J., 81, 312
 Bewley, W. F., 254
 Biggs, C. E. J., 388
 Bijhouwer, A. P. C., 41, 228
 Bird, M., 276
 Blanchard, V. F., 375
 Blatt, R. J., 193, 373, 379
 Bobilioff, W., 287, 397
 Bois, D., 1
 Bonnet, J., 270
 Boryscook, N. A., 235
 Bottini, E., 105, 108
 Bowman, G. F., 403
 Boyle, R. A., 348
 Bracewell, M. F., 303, 412, 414
 Bradford, F. C., 154
 Branscheidt, P., 140
 Braverman, J. S., 362
 Brereton, W. le Gay, 203
 Brierley, W. G., 7
 Brittain, W. H., 24
 Broadfoot, H., 301
 Brown, D. D., 82
 Brunstetter, B. C., 68
 Bunting, B., 189
 Burger, I. J., 329
- Cameron Brown, C. A., 220
 Campbell, J. A., 111
 Carne, W. M., 233
 Carrante, V., 364
 Casella, D., 337, 365
 Casella, Prof., 378
 Chace, E. M., 77, 419
 Chevalier, A., 91, 185
 Childs, L., 229
 Clark, L. H., 405
 Clark Powell, H., 217
- Cobb, A. J., 415
 Collins, J. L., 406
 Confederazione Nazionale Fascista
 Agricoltori, 425
 Cooke, F. C., 183, 402
 Cooper, H. R., 188, 387
 Cope, J. A., 255
 Copeman, P. R. v. d. R., 79
 Cramer, P. J. S., 289
 Crane, M. B., 413
 Crist, J. W., 339
 Croce, F. M., 264
 Crocker, W., 331
 Cruess, W. V., 211
 Curtler, E. A., 284
- Dahl, C. G., 35, 122
 Dalmasso, G., 18, 19
 Darrow, G. M., 9, 357
 Davenport, A. B., 201
 Davey, W. H., 180
 Davis, M. B., 44
 Davis, W. B., 179
 Degman, E. S., 45
 Doovina, O. M., 26
 Dutt, N. L., 277
- Eckart, T. G., 311
 Eckerson, Sophia H., 340
 Eden, T., 280
 Einset, O., 15
 Elliott, E. C., 423
 Empire Marketing Board, 93, 319
 Evans, G., 381
 Ext, W., 253
- Faes, H., 16
 Fawcett, H. S., 170
 Ferrara, A., 262
 Fowler, R., 327
 Freise, F. W., 420
 Frey-Wyssling, A., 191
 Furr, J. R., 238
- Gadd, C. H., 282
 Gardner, V. R., 216
 Garretsen, A. J., 281
 Georgi, C. D. V., 401
 Geraldine, C. de M., 97, 98
 Gerhart, A. R., 8
 Gibbs, M. A., 53
 Gilbert, S. M., 181
 Gleisberg, W., 30, 31, 32, 335
 Gourley, J. H., 2, 49
 Gregory, J. H., 418
 Greve, E. W., 165
 Grove, O., 214, 215
 Grubb, N. H., 48, 162
- Haas, A. R. C., 76, 267, 268, 294,
 369
 van Hall, C. J. J., 390, 394
 Halma, F. F., 175
 Hanson, H. C., 358
 Harder, R., 326
 Harlow, L. C., 46
 Harris, G. H., 64
 Harrison, G. J., 274
 Hartman, H., 308, 309
 Hartshorn, R., 313
 Harvey, E. M., 236
 Harvey, R. B., 155
 Hatfield, I., 113
 Hatton, R. G., 29, 125
 Heermann, W., 166
 Heinicke, A. J., 57, 136
 Heintz, G. V., 328
 Hillenmeyer, W. W., 124
 Hodgson, R. W., 363
 Hofmann, F. W., 47
 Holland, T. H., 383
 Hooper, C. H., 244
 Hopfinger, J. C., 142
 Hopkins, E. F., 145
 Howard, A., 422
 Howlett, F. S., 27
 Huggins, H. D., 184
 Hunter, R. E., 368
 Hunter, W. T., 428
 Hutchins, A. S., 119
- Imperial Bureau of Fruit Pro-
 duction, 109
 Imperial Institute, 95, 380
 Irish, C. P., 246
 Irwin, J. O., 323
- Jacob, A., 424
 s' Jacob, J. C., 288, 291
 Janssens, P., 92
 Joachim, A. W. R., 382
 Johansson, E., 139, 160
 Johnston, S., 129, 258
 Johnstone, Katharine H., 324, 355
 Jones, L. H., 114
- Kelley, V. W., 156
 Kemmer, E., 351
 Kerbosch, M., 286
 Kidd, F., 100
 Kimball, D. A., 225
 Kinman, C. F., 38
 Kirkham, V. H., 186
 Knight, R. C., 58
 Knowlton, H. E., 147
 Kobel, F., 317
 Kohman, E. F., 325

INDEX OF NAMES

Kolesnikov, V. A., 65
Kosemanoff, S. I., 121
Kvarazkhelia, T. K., 67, 135

Lange, K. P., 34, 70
Leoncini, G., 104, 106, 107
Lord, E. L., 80

MacDaniels, L. H., 59, 141
Macoun, W. T., 252, 427
Magness, J. R., 55, 237
Malins-Smith, W., 182, 391.
Manaresi, A., 333, 352
Mann, C. E. T., 10, 399
Markley, K. S., 242
Marshall, R. E., 249
Martin, G., 293
Martin, J. T., 157
Matubara, S., 336
McKinnon, L. R., 347
McLintock, J. A., 40
Mehlitz, A., 376
Miller, R. W. R., 384
Milsum, J. N., 190
Minderhoud, A., 144
Ministry of Agriculture, 416, 426
Morgan, A. F., 206
Motz, F. A., 200
Mrak, E. M., 210
Mulay, A. S., 239
Mumford, E. P., 159
Murneek, A. E., 241, 245

Neller, J. R., 307
Nichols, P. F., 20
Nielsen, J. A., 123
Niklas, H., 272
Niethammer, A., 4
Nuccorini, R., 72, 73, 74
Nutman, F. J., 385

Ochse, J. J., 218, 219
Ostendorf, F. W., 396
Overholser, E. L., 143, 259

Paille, M., 256
Painter, A. C., 151
Palmer, E. F., 28
Palmer, R. C., 202, 408
Paponof, N. V., 359
Parsons, T. H., 298
Partridge, N. L., 17, 261
Pashkewitch, W., 343
Passecker, F., 21
Pearl, R. T., 60
Pilling, M., 149
Plagge, H. H., 101, 146
Pole Evans, I. B., 205
Poliakoff, N. K., 56
Pollacci, G., 178

Pope, W. T., 99
Potter, G. F., 240
Prillwitz, P. M. H. H., 90, 279
Prizer, J. A., 176
Pyke, E. E., 392

Quinan, K. B., 342
Quinn, G., 374

Rahman Khan, A., 25
Ramsay, A. A., 209
Rasmussen, E. J., 54
Read, F. M., 338, 349
Reed, H. S., 370
Reichert, I., 377
Reinecke, O. S. H., 23, 341
Reinhold, J., 5
Riabov, I., 322
Riabov, J. N., 138
Ritter, R., 318
Roach, W. A., 133, 134
Roberts, R. H., 230
Robinson, H. E., 83
Rogers, W. S., 115, 164
Rols, P. H., 366, 367
Romeo, A., 361
Roodenburg, J. W. M., 3
Royal Horticultural Society, 110
Rudloff, C. F., 116, 223
Russell, G. T., 194
Ruth, W. A., 50, 148

Sachoff, Th., 345
Samuels, C. D., 177
Sanderson, A. R., 398
Sands, W. N., 300
Sayed, I. A., 299
Schellenberg, A., 251
Schindler, O., 231
Schratz, E., 117
Seeley, W. H., 372
Sen, H. D., 314
Sethi, R. L., 285
Shaw, J. K., 128, 224
Shill, A. C., 87
Sicard, H., 167
Skutch, A. F., 296, 404
Sledge, W. A., 66
Smith, F., 118
Smith, F. E. V., 196
Smith, Laura L. W., 243
Smith, W. H., 197
Snowden, J. D., 389
Spinks, G. T., 127
Sprenger, A. M., 120
Stägmeyr, E., 350
Staniland, L. N., 158
Stratton, F. C., 297
Summers, F., 400
Swarbrick, T., 33, 61, 126, 161

Tanaka, T., 266
Tanaka, Y., 265
Taylor, H. V., 212
Tengwall, T. A., 96, 291, 292
Tetley, U., 69
Theron, C. J., 13, 14
Thomas, J. E., 207
Thomas, M., 305, 306
Thomas, P. H., 150, 152
Thornton, N. C., 304
Tiller, L. W., 102
"The Times," 409
Tomkins, R. G., 410
Toxopeus, H. J., 75, 173
Triquart, J., 356
Trotter, A., 360
Trout, S. A., 103, 199
Tubbs, F. R., 283
Tufts, W. P., 71
Tukey, H. B., 39, 226
Tunstall, A. C., 88, 89

Uphof, J. C. T., 172, 371
Upshall, W. H., 36, 130, 227, 334

Vidal, J. L., 168
de Villiers, F. J., 85, 86, 316
Vogel, F., 221, 332
Vollema, J. S., 395
Vyvyan, M. C., 63, 132

Wagner, F., 248, 260
Waldo, G. F., 11, 12
Walker, A., 195
Wallace, T., 43, 153, 247
Wardlaw, C. W., 411
Waring, J. H., 250
Wartenberg, H., 52
Washington, 320
Watanabe, R., 234
Waynick, D. D., 78
Webber, H. J., 174
Weinberger, J. H., 51
Wellensiek, S. J., 278, 396
Wenholz, H., 222
Wentworth, S. W., 22
West, C., 407
West, E. S., 84, 354
Wicks, H. N., 232
Wiegand, E. H., 310
Wille, J., 187
Williams, C. H. B., 275
Witt, A. W., 6, 131
Woodman, R. M., 271
Wye, 321

Youden, W. J., 421

Zillig, H., 263
Zilva, S. S., 198

SUBJECT INDEX

Horticultural Abstracts, Volume I

- Acetaldehyde, 199
 Acetylene, 313
 Acids, non-volatile organic, 72, 73, 74, 107
 Aeration of roots, 246
 Almonds, 209
 Apples—
 arsenic determination, 421
 biennial bearing, 232, 233, 338
 culture in South Australia, 327
 effect of ethylene on, 302
 flower buds, 53, 54, 234, 240
 grading, 415, 416
 growth, 58, 69, 238
 identification, 60, 224
 juice, 214
 leaves, 55, 57, 237
 manuring, 42, 43, 44, 45, 47, 48, 49, 50, 51,
 145, 146, 147, 149
 packing, 204, 417
 pollination, 22, 24, 27, 141, 142
 production, 2, 327
 pruning, 58
 nitrogen content, 241
 reducase, 340
 ringing, 59, 153, 251
 root cuttings, 36, 334
 rootstocks, 33, 35, 61, 62, 63, 126, 127, 128,
 132, 133, 134, 230, 335
 scab resistance, 355
 skin permeability, 242
 spray damage, 156
 storage, 100, 101, 102, 197, 200, 201, 202,
 301, 305, 306, 307, 407, 408
 vitamin content, 198, 303, 412, 413
 woolly aphis, control of, 158
 Apricots, vitamin content, 206
 Arsenic determination on apples, 421
 Avocados, 193, 194, 295, 379
 Bananas, 195, 196, 296, 297, 313, 403, 404, 410,
 411
 Bartlett pear, 37, 239
 Bees, 144
 Berries, storage of, 310
 Biennial bearing, 232, 233, 338
 Bilberries, 186
 Blackberries, 357
 Black currants, 163
 Books and reports, notes on, 1, 91, 216-219, 317-
 321, 422-428
 Boron and citrus growth, 76, 267, 369
 Breeding, 28, 222, 223, 330, 359
 Bud—
 axillary, of peach trees, 333
 selection, citrus, 81, 174
 variants, citrus, 77
 By-products—
 citrus, 86, 87, 316, 362, 376
 coffee, 420
 Cacao. See Cocoa.
 Callusing and rootstock selection, 31
 Campbell Early Grape, 17
 Camphor, 178
 Canada, rept. of horticulturist for 1930, 427
 Canning, 409
 Carbon dioxide—
 and plant growth, 326
 and storage, 304
 Cardamoms, 284
 Cashew nut, 299
 Castor oil plant, 285
 Chambers, plant containers, 113, 114
 Cherries—
 culture, 216
 germination, 26
 pollination, 140, 143, 345
 rootstocks, 39, 40, 130
 transplanting, 227
 unproductiveness, 38
 Chlorosis, 257
 Cider, 212, 213
 Cinchona, 286
 Citrus—
 and sub-tropical fruit growing, 75-87, 170-
 180, 265-271, 362-379
 Citrus—
 boron necessary for, 76, 267, 369
 bud selection, 81, 174
 by-products, 86, 87, 316, 362, 376
 chemical composition, 77, 79, 268
 culture, 170, 171, 217, 362, 363
 cuttings, 175, 368
 essential oils, 85, 86
 flower of Tahiti lime, 172
 frost protection, 84
 fruiting, 83
 growth, 365
 habitat, 266
 irrigation, 176, 372
 juices, 419
 leaf, 370, 371
 Little Leaf, 377
 manuring, 80, 176, 177, 373, 374
 packing, 205
 polyembryony, 75
 renovation, 375
 ringing, 82
 rooting, 78
 rootstock, 173, 265, 363, 366, 367, 368
 selection, 364
 spraying, 269
 storage, 108, 312
 variety *C. trifoliata*, 376
 Cloves, 186
 Coca, 187
 Cocoa, 93, 94, 181, 182, 315, 383, 390, 391, 392
 Coconut, 184, 402
 Coffee, 91, 92, 185, 383, 388, 389, 420
 Conference, First Imperial Horticultural, list of
 papers, 109
 Congress, Ninth International Horticultural, list
 of papers, 110

SUBJECT INDEX

- Copra, 183
- Cotton, 273, 274
- Cucumbers, 3
- Cuttings—
 - apple root, 36, 334
 - citrus, 175, 368
 - cocoa, 392
 - tea, 386
 - the rooting of woody, 66
- Deciduous fruits. See under separate fruits.
- Deglet Noor Palm, 294
- Dehydration of fruits, 20, 206
- Dieback (physiological), 341
- Direct producers, 18
- Dutch East Indies—
 - fruits of, 219
 - vegetables of, 218
- Dyes, introduction into plant tissues, 236
- Electric lighting, 3, 4, 117, 220
- Ethylene for ripening, 179, 302, 325
- Ethylene oxide as fumigant, 207
- Experimental work—
 - basis of, 322
 - field, with rubber, 395
- Figs, 328, 329
- Flower bud of apples, 53, 54
- Food plants, 1
- Fruit—
 - bud of apple, 234, 240
 - of strawberry, 11, 12
 - chemical composition of, 72, 73, 74
 - growing, a manual of, 317
 - setting in pecan, 169
 - supplies in 1930, 319
- Fruiting of citrus, 83
- Germination of cherries, 26
- Glass, light transmissibility of, 118
- Grading apples, 415, 416
- Graft hybrids, 116
- Grafting, 336. See also under Rootstocks.
- Grapefruit—
 - in Trinidad, 171
 - vitamin content, 414
- Grapes. See Viticulture.
- Grass, effect on young trees, 231
- Ground nut, the Bambarra, 300
- Growth—
 - of apple rootstock, 132
 - of young citrus, 365
 - and moisture supply, 137
 - and pruning, 58, 353
 - and soil, 136
- Hazel, 360, 361
- Hedges, 252
- Hydron concentration, determination of, 68
- Identification—
 - of apples, 60, 224
 - of Mazzard and Mahaleb, 130
 - of rubber, 191, 287, 397
- Imperial College of Tropical Agriculture, 381
- Insect pests, 158, 159
- Institia plums of Mleev, 121
- Irrigation of citrus, 176, 372, 373
- Keeping qualities—
 - acidity changes associated with, in apples, 101
 - effect of manuring on, 45, 49, 51, 146, 147, 149, 350
- Leaf—
 - of apples and other fruit trees, 55, 56, 237
 - of citrus, 370, 371
 - diagnosis of fertilizer needs, 245
- Leaf Scorch, 349
- Lemons, 364, 372
- Light, effect of, on plants, 243
- Lighting, artificial, 3, 4, 117, 326
- Lime, the Tahiti, 172
- Little Leaf in citrus, 377
- Long Ashton, The National Fruit and Cider Institute, 112
- Magnesia, toxicity of, to sugar cane, 276
- Mahaleb, 26, 39, 130
- Mallee scrub, 354
- Mango, 298
- Manuring—
 - of apples, 42, 43, 44, 45, 47, 48, 49, 50, 51, 145, 146, 147, 149
 - methods of application, 246, 347
 - of citrus, 80, 176, 177, 373, 374
 - of cocoa, 383
 - of coffee, 383
 - of grapes, 167, 261
 - green, 382, 383
 - and leaf diagnosis, 245
 - nitrogenous, 148, 348
 - organic, 422
 - of pears, 248
 - potassic, 247, 348, 349, 350
 - review of results, 346
 - of small fruits, 260
 - and soils, 46, 52
 - of strawberries, 51, 165
 - of sugar cane, 275
 - of tea, 90, 188, 383
 - of tropical crops, 272, 382, 383, 422, 424
- Masters Memorial Lectures 1930 and 1931, 29, 330
- Mazzard, 39, 130.
- Melons, 3
- Metaxenia in cotton, 274
- Meteorology, 323, 341, 342
- Mildew of vine, 167
- Mulching with paper, 5, 119
- New varieties of deciduous fruit, 28.
- New Zealand, fruitgrowing in, 111
- Nursery—
 - apple rootstocks, 34
 - citrus, 84, 174
 - frost injury, 70, 84
 - pome and stone fruits, 34
 - and soil sickness, 122, 332
- Nutrition. See Manuring etc.
- Nuts. See under particular varieties.
- Oil palms, 97, 98, 189, 190, 401
- Oils, essential, of citrus, 85, 86
- Olives, 270, 378
- Oranges—
 - by-products, 87

SUBJECT INDEX

- chemical composition, 77, 79
- culture, 217
- storage, 108, 312
- vitamins, 414
- Ornamentals, 4
- Packing—
 - of apples, 204, 415, 417
 - of citrus, 205
 - equipment, 203
 - processing, fruit products, 203-215, 314-316, 415-421
 - of tropical fruits and strawberries, 418
- Panama disease, 196, 404
- Papaya, 99, 314
- Paper mulching, 5
- Passion fruit, 180
- Peaches—
 - axillary buds, 333
 - juice constituents and storage, 107
 - manuring, 51
 - pollination, 25
 - pruning, 249
 - rootstocks, 131
 - storage, 107
 - thinning, 352
- Pears—
 - growth and moisture supply, 137
 - leaf area, 55
 - manuring, 248
 - in Ontario, 225
 - pollination, 344
 - ringing, 251
 - ripening, 37, 302
 - rootstocks, 129, 229, 335
 - shoots, composition of, 239
 - stone cells, 339
 - storage, 103, 104, 105, 308, 309
- Peat, 226, 324
- Pecan, fruit setting in, 169
- Pectin—
 - in apple cell walls, 69
 - and delayed deterioration in plums, 106
- Perry, 215
- Persimmon, Japanese, 179
- pH. in canning and bottling, 211
- Phyllotaxis in rubber, 396
- Pineapple, 311, 405, 406
- Planting—
 - of deciduous trees, 123, 124, 227
 - of rubber, 399
 - of tea, 281
- Plums—
 - the Insititia, 121
 - effect of pruning on growth, 58
 - storage, 104, 106
 - thinning, 151, 250
- Pollination—
 - of apples, 22, 24, 27, 141, 142
 - of cherries, 140, 143, 345
 - of deciduous fruits, 23, 138, 139, 343
 - of grapes, 15
 - and insects, 144, 244
 - of oil palms, 190
 - of peaches, 25
 - of pears, 344
 - of rubber, 288
 - sugar solution tests, 21
- Polyembryony in citrus, 75
- Pomaceae, young growth forms, 337
- Pot experiments, 221
- Prickly pear, 271
- Processing, 206, 209, 210, 212-215, 314-316, 419, 420
- Propagation, vegetative, 36, 378, 386, 389, 392, 403. See also under Rootstocks, Cuttings etc.
- Prunes, 206, 210
- Pruning—
 - of deciduous trees, 58, 150, 249, 264, 353
 - of tea, 282, 283
- Pyrethrum, 157
- Raphia, 192
- Raspberries—
 - selection, 258, 356
 - senescence, 7
 - varieties, 160, 161, 162
- Recording apparatus, 115
- Records, precision, 323
- Reducase in apple organs, 340
- Renovation of citrus orchards, 375
- Research in the Empire, 380, 381, 426
- Respiration in strawberries, 8, 259
- Ringling—
 - of apples and other deciduous fruit trees, 59, 153, 154, 251
 - of citrus, 82
- Ripening—
 - of bananas, 297, 313
 - and organic acid content, 74
 - of pears prior to retail, 208
 - and seasonal temperatures, 71
- Root—
 - cuttings, propagation of apples by, 36, 334
 - growth of fruit trees, 65, 67, 78, 135
 - growth and rootstock selection, 31
 - growth of strawberries, 10
 - growth of tea, 83
 - growth of woody cuttings, 66
 - regeneration of apples, 33
- Rootstocks—(See also under Stock-scion relationships)
 - of apples, 33, 35, 42, 61, 62, 63, 126, 127, 128, 132, 133, 134, 230
 - of cherries, 39, 40, 130
 - of citrus, 173, 265, 363, 366, 367, 368
 - of coffee, 185, 389
 - of deciduous fruit trees, 29, 30, 31, 34, 64, 125, 335
 - grafting and compatibility, 336
 - of peaches, 131
 - of pears, 37, 129, 229
 - and use of peat, 226
 - selection according to rooting and callusing, 31
 - of rubber, 400
 - top grafting, 32
 - of vines, 16, 18, 19, 168
- Rodents, control of injury by, 155
- Rosaceous seeds, germination and storing of, 331
- Rubber—
 - experimentation methods, 395
 - growth, 398
 - identification, 191, 287, 397
 - latex bore theory, 289, 290
 - phyllotaxis, 396

SUBJECT INDEX

- plasticity, 293
- pollination, 288
- rootstock, 400
- tapping systems, 291, 292
- various, 96, 394, 399

- Scab, varietal resistance to apple, 355
- Scion, position of top bud, 126
- Seeds, storing and germination of rosaceous, 331
- Selection—
 - of black raspberries, 258, 356
 - of fruit trees, 120
 - of lemons, 364
 - of tea, 278
- Self-fruitfulness in apple, 27
- Senescence, 7, 41, 228
- Shading—
 - of cocoa, 391
 - of cocoa and coffee, 383
 - in tea plantations, 279
- Sisal, 384, 385
- Small fruits—
 - yines, nuts, 6-20, 160-169, 258-264, 356-361
 - manuring of, 260
- Soil—
 - and growth, 136, 238, 273
 - and manures, 46, 52
 - and manures in citrus groves, 80
 - sickness in nursery, 122, 332
 - sterilization, 254
 - vineyard, 14, 263
- Solar propagator, 368
- Spray damage, 156, 269
- Spraying to prevent delayed foliation, 342
- Spur unit method, 22
- Standardization of material. See Rootstocks.
- Stock-scion relationship—(see also Rootstocks)
 - in apples, 61, 62, 63, 126, 230
 - chemistry of, in apples, 133, 134
 - in citrus, 173, 265
 - in deciduous fruit trees, 29, 64, 336
 - in rubber, 400
- Stomata on citrus leaves, 370
- Storage, 100-108; 197-202, 301-313, 407-414
- Storage, acetaldehyde in, the use of, 199
 - of apples, 101, 102, 197, 198, 200, 201, 202, 301, 302, 303, 305, 306, 407, 408
 - of bananas, 313, 410, 411
 - of berries, 310
 - of citrus, 108, 205, 312
 - of cocoa, 94
 - effect of CO₂ on, 304
 - gas storage of fruit, 100
 - of peaches, 107
 - of pears, 103, 104, 105, 301, 302, 308, 309
 - of pineapples, 311
 - of plums, 104, 106
- Strawberries—
 - cultivation of, 164
 - growth in, 9, 10, 11, 12, 358
 - manuring, 51, 165
 - packing, 418
 - respiration, 8, 259
- Stubs, removal of, 34
- Stumps, removal of tree, with sodium arsenite, 265
- Sugar—
 - cane, 275, 276, 277
 - solution for pollination tests, 21

- Sulphur manuring for tea, 90
- Summerland Experimental Station Report for 1930, 428
- Sunscauld, 155
- Sweet peas, 3

- Tea—
 - leaves, 89
 - manual of tea planting, 423
 - manuring, 90, 188, 383
 - planting, 281
 - plucking, 387
 - propagation by cuttings, 386
 - pruning, 282, 283
 - roots, 88
 - selection, 278
 - shading, 279
 - yields, 280
- Temperature and ripening, 71
- Thinning—
 - of peaches, 352
 - of plums, 151, 250
- Tomatoes, 3, 325
- Top grafting, 32, 152
- Training of fruit trees, history of, 351
- Transpiration of deciduous fruit trees, 57, 235
- Transplanting. See Planting
- Tropical crops, 88-99, 181-196, 272-300, 380-406
- Tropical fruits, harvesting, packing and marketing, 418
- Tung oil, 95, 393

- United States of America, trade in horticultural produce in. 318

- Vegetables—
 - mulch paper for, 119
 - of Dutch East Indies, 218
- Vermis, 155
- Vitamins—
 - in apples, 198, 303, 412, 413
 - in apricots and prunes, 206
 - in citrus, 414
- Viticulture—
 - in Algeria, 262
 - in Europe, 13
 - breeding, 330, 359
 - dehydration of grapes, 20
 - direct producers, 18
 - fruiting of Campbell Early, 17
 - manuring, 167, 261
 - pollination, 15
 - rootstocks, 16, 19, 168
 - soils, 14, 263
 - table grapes, 425

- Walnuts, 6, 264
- Washington State Horticultural Association, 26th Annual Meeting, 320
- Waste products of agriculture, 422
- Weeds, 256, 271, 357
- Winter injury, 70, 84, 229, 253, 354
- Woolly aphid control, 158
- Wye, Journal of the South-Eastern Agricultural College, No. 28, 321